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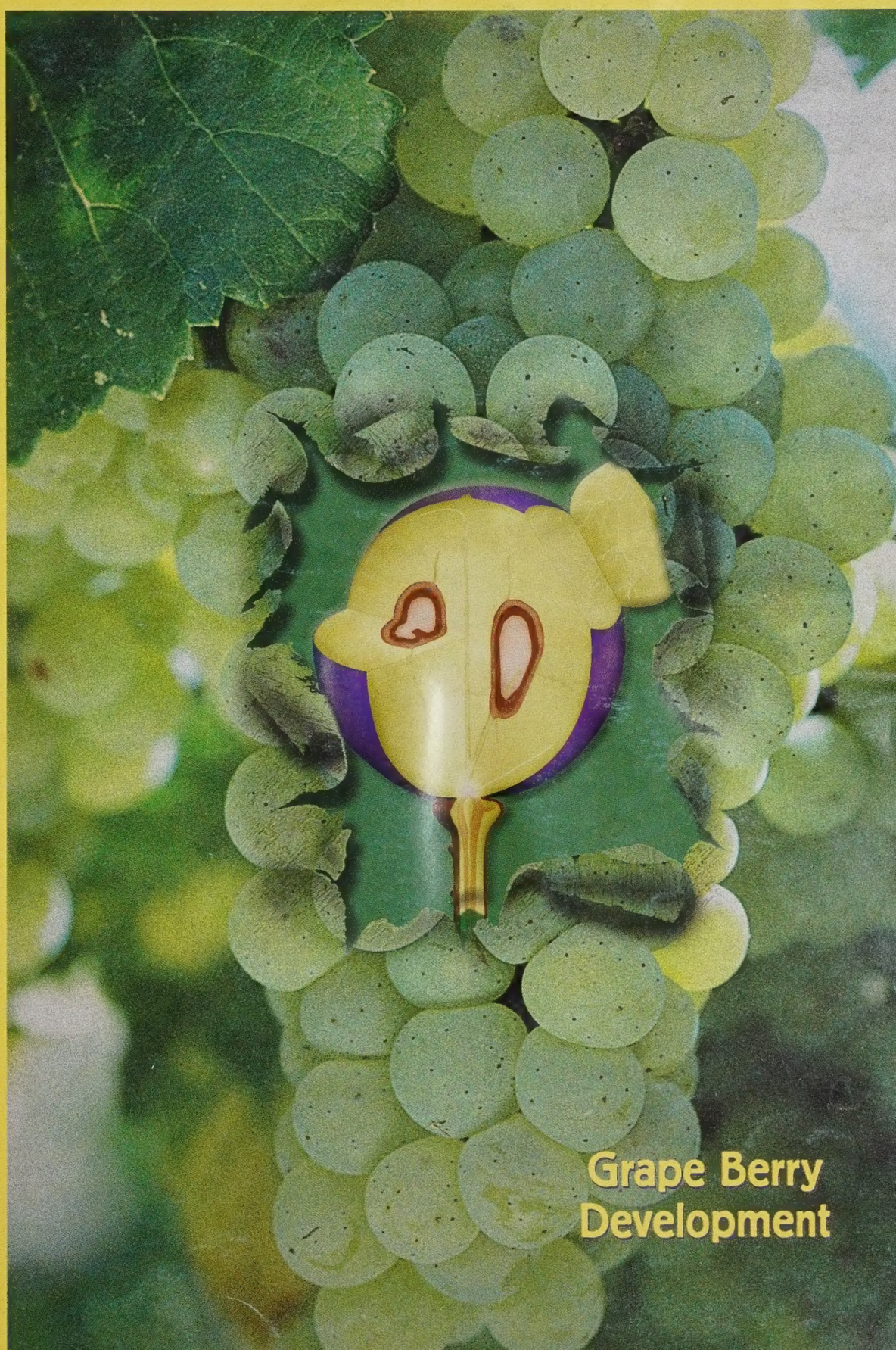

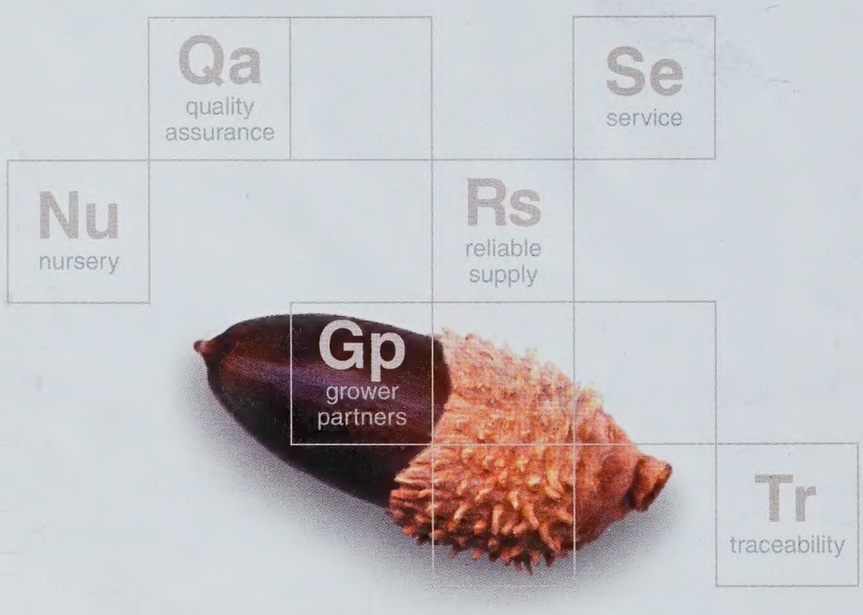

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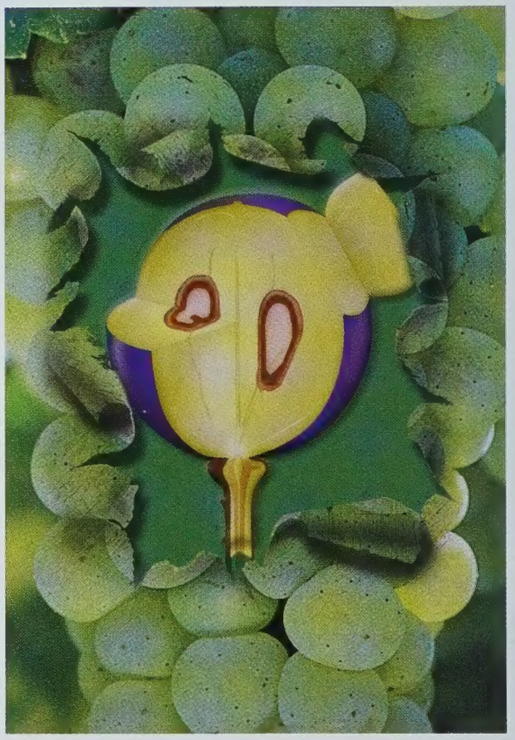

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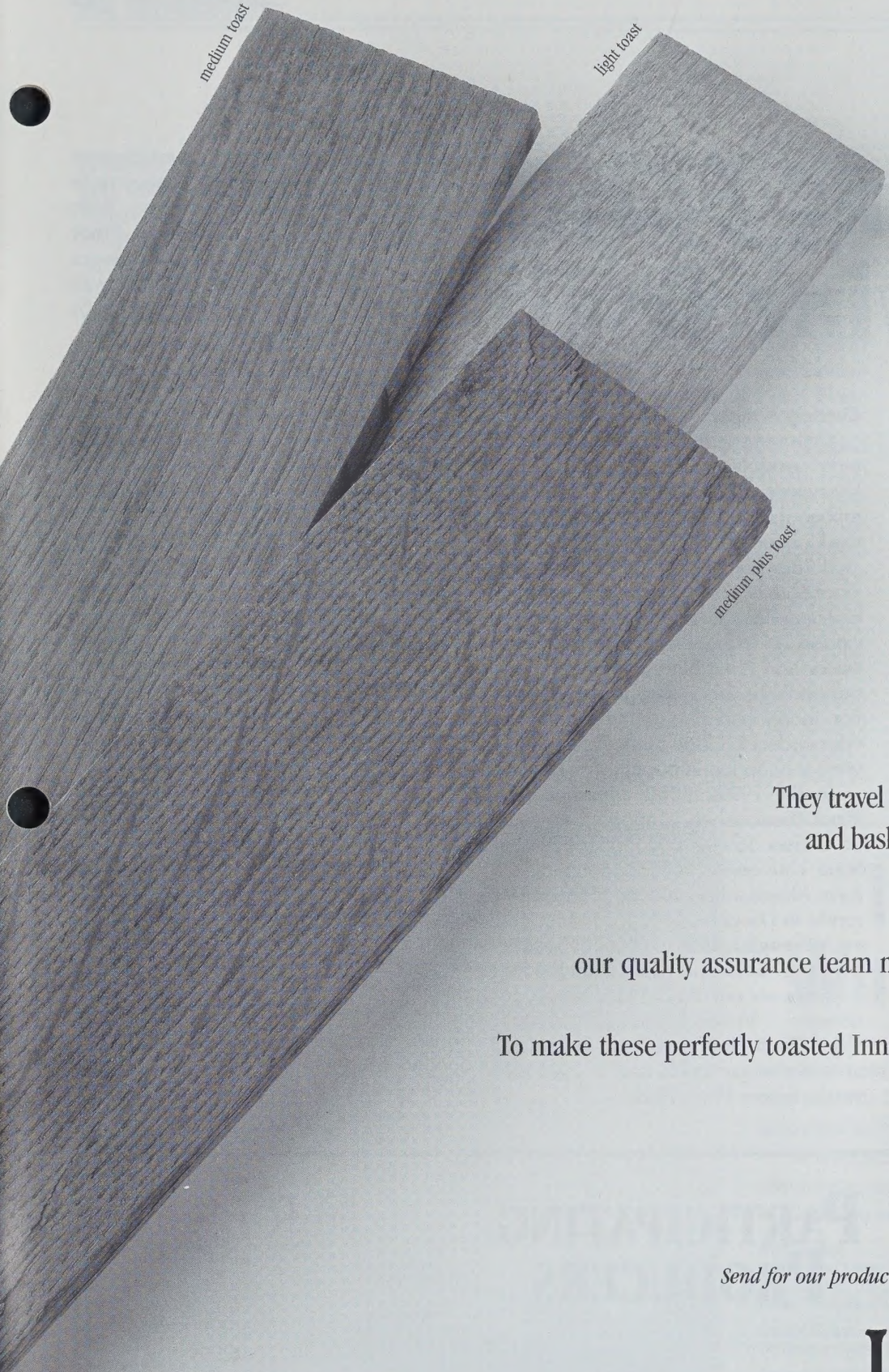

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VARIETAL REVIEW

Pinot Blanc *blazes* Oregon wine trail

BY Eleanor & Ray Heald
Contributing editors

Chic, snappy, sassy. Pinot Blanc doesn't have that ring in the mind of consumers — yet. Catchy promos such as "Blancs have more fun," haven't foiled the wine's image problem — yet. Pinot Blanc, however, is a variety poised on the edge of greater consumer recognition in the U.S.

It's an Old World variety, grown in Alsace, Burgundy, Italy, Austria, and Germany. Although different styles have emerged, wines from premium sites in those countries are lauded.

In the New World, Oregon's success with the variety is emerging. Much of the wine labeled Pinot Blanc in California is not the real thing. Misidentified as Pinot Blanc, most is Melon de Bourgogne (Melon for short), the variety used in the production of Muscadet in the Loire Valley of France.

Which brings us to the potential allure of Oregon Pinot Blanc — it's the real McCoy!

Getting it right

"Misnaming is not an underhanded plot," said Myron Redford of Amity Vineyards. "It's the result of a colossal mixup during the 1960s and 1970s at the University of California, Davis."

It's now believed that the Foundation Plant Materials Service (FPMS) probably had true Pinot Blanc at one time but discarded it and retained Melon. Since Melon and Pinot Blanc have similar leaf morphology, this is easy to understand. For more than two decades, growers who ordered Pinot Blanc from FPMS were sold Melon in error.

In the 1980s, FPMS obtained true Pinot Blanc when it received cuttings of Clones 159 and 161 from Oregon State University. Both of these clones have Alsace origin and are planted currently in Oregon.

Although leaf shape may be similar, growing habits and wines from the two varieties are not. Pinot Blanc shoots are droopy. Melon grows upright. Typically, Melon develops ripe flavors at lower sugar levels and at least two weeks before Pinot Blanc.

Oregon winemaker participants note that Melon expresses a soapy taste when allowed to get too ripe. Both wines have an apple component. Pinot Blanc is citrusy with mineral flavors that evolve into a floral element over time. Melon showcases more apricot and anise characters.

Creating an Oregon style

Two Pinot Blanc wine style camps have emerged in Europe. Pinot Blanc from Alsace is rather earthy, and although flavors are complex, overall weight and texture are light. Part of the earthiness stems from the fact that in Alsace, the term Pinot Blanc is used for a wine that can be blended with Auxerrois, which displays an earthy component.

The most significant difference in Alsace Pinot Blanc style is created by a producer's decision to have wine undergo full or partial malolactic fermentation (MLF), and whether the wine is given extended lees contact.

In Italy's Alto Adige and Friuli regions, Pinot Blanc rides solo and is known as Pinot Bianco. These medium weight wines showcase intense fruit and are as important in the region as Pinot Grigio, although the latter has grabbed the international spotlight currently.

Most of the Oregon winemakers we spoke with do not use new oak barrels for fermentation or ageing, preferring neutral oak, stainless steel fermentors, or a combination of both. Yamhill Valley Vineyards, however, uses about 10%

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new cooperage for vintage Pinot Blanc and about 75% older cooperage for Reserve Pinot Blanc. Torii Mor uses 25%.

All of the winemakers use 90% or more Pinot Blanc in the wines, and if the wine is blended, it's with Auxerrois. Many participants do not allow full MLF, opting for the preservation of fruitiness through partial MLF or none at all.

Pinot Blanc has only a 20-year history in Oregon. Producers are finding their way, based on the location of vineyards and personal stylistic preferences. At this juncture it is too early to talk about an "Oregon style." More meaningful in the future may be to reference a Willamette Valley, northern Oregon, cooler-climate style and the warmer climate style of Rogue Valley and Medford-Ashland.

Encouraging signs

Yamhill Valley Vineyards plans to increase production of Pinot Blanc significantly. Winemaker Steven Cary believes it is perfectly suited to Oregon. "If we in Oregon only made varietals that we knew were going to be instant successes," he says, "we wouldn't have planted Pinot Noir or Pinot Gris. At some point, a winery must believe in what it's doing. All of us here at this varietal review believe in the ultimate success of Pinot Blanc in Oregon."

Amity Vineyards has also ramped up production — from 300 to 1,300 cases — and is sold out each year before the next vintage is ready for release. Yet winemaker Myron Redford sells very little of his production in the home market. Biggest markets are Chicago, Seattle, and North Carolina, where there have been wine-by-the-glass promotions.

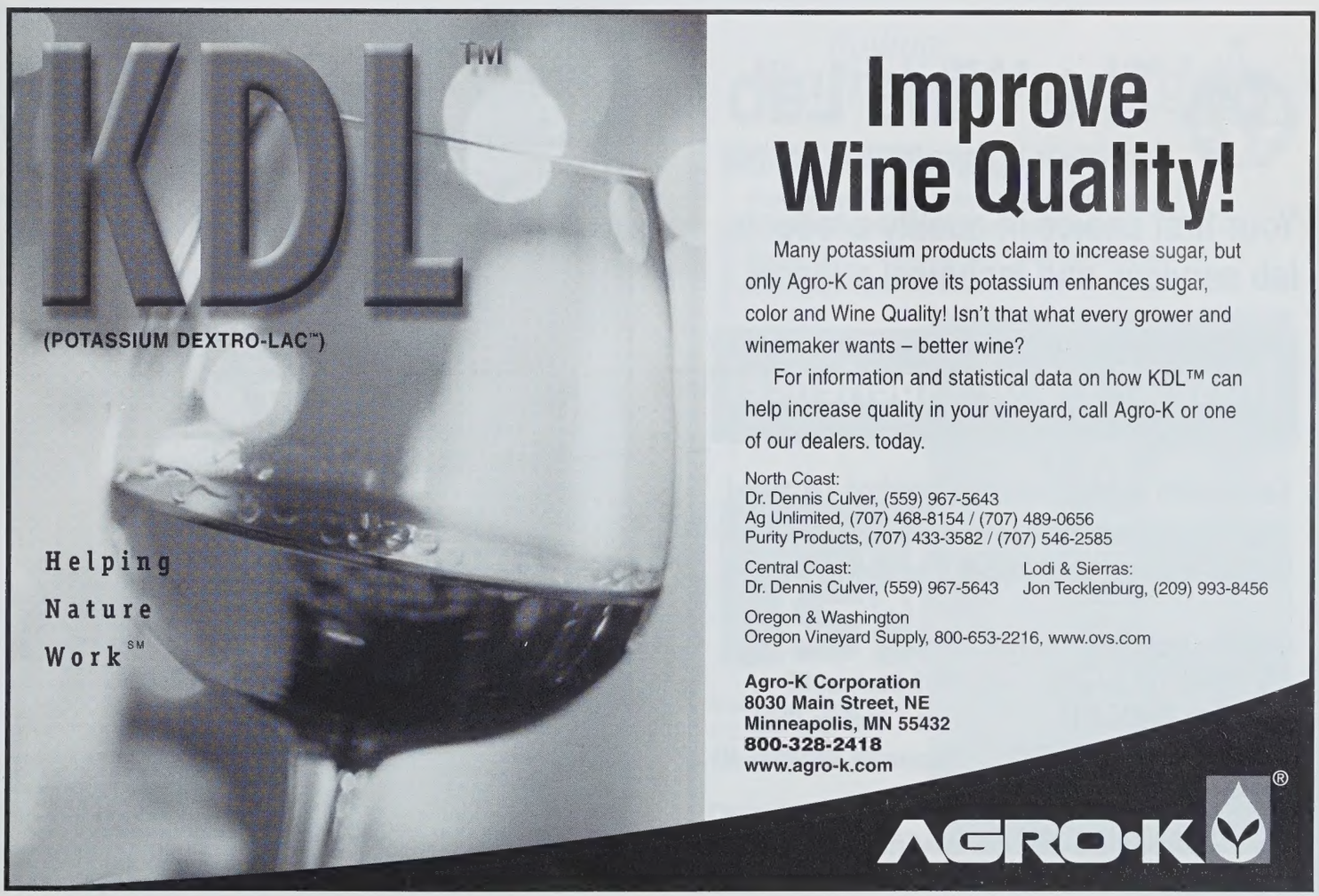
"The consumer has not yet discovered Pinot Blanc or if they have, they sometimes confuse it with Pinot Gris," Redford contends. "The only way to get people to try it is by either having it poured by the glass or case-stacked in an enthusiastic retail outlet. A producer cannot put it on a retail shelf and expect that it will sell. However, when people try it, they like it.

"Ultimately, Chardonnay is going to be a minor part of the Oregon wine scene. The northern part of the state, in particular, is going to be known for Pinots — Pinot Noir, Pinot Gris, and Pinot Blanc."

Growing it best

Yamhill Valley Vineyards has planted a 10-acre, variable hillside, formerly Chardonnay vineyard on rootstocks 3309, 101-14, and a little Riparia Gloire in the wettest soil segment. The vines produced their first tiny crop in 2001. Based on the growth patterns and the quality of fruit, the rootstock selections appear to be appropriate.

Like any other moderately vigorous grape variety, Pinot Blanc grows best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on shallow, infertile soils. Heavy soils require more vineyard management above and below ground. Winemaker Joe Dobbes (Tualatin and Torii Mor) notes that in southern Oregon, there's more botrytis on vines in heavier soils than on those planted in lighter soils.

When vines were first planted in Willamette Valley, the deeper, volcanic origin, Jory series soils were highly touted. Terry Casteel of Bethel Heights explains that these soils vary considerably in depth, from three feet to as much as 20 feet (with rock content). They are bright red with high iron content and are the typical red soils of the Dundee region.

Shallower versions of this volcanic soil type exist in the Eola Hills and Chehalem Ridge. The soil series Nekia averages three feet. Rittner, also shallow, is more gravelly and drains faster.

Because the Willamette Valley formed from an inland sea, there's significant sand in the subsoils. This is true not only of low-lying vineyards. Ridge Crest, about 25 miles northeast of Yamhill, has sandy subsoil at 600 to 800 feet of elevation.

Willakenzie soils are sedimentary (ocean bottom). Because of the sand content of this soil type, it tends to dry out much more quickly. In Willakenzie soils, Pinot Blanc ripens earlier than in Jory soils.

In southern Oregon, most soils are very deep and old, created by Pacific Ocean plate uplifts. This means most are metamorphic in origin with little sandy loam.

With all these soil profiles to consider, winemakers have not yet discovered the soil's full impact on Pinot Blanc.

Crop loads

Terry Casteel suggests a ripening advantage for vines planted on hillsides closer to the valley floor in the Willamette Valley American Viticultural Area (AVA).

Redford suggests that the valley floor yields are higher by about a ton per acre (TPA), and quality may be compromised. His preference is undercropping at higher elevations to ensure maturation of this later-ripening white variety.

In an attempt to practice sustainable viticulture and ensure balanced vines, Redford devigorated a vigorous site by laying solid turf (sheep fescue) in the aisles and under the vines. At first it worked well, but then it devigorated the vines too much and reduced crop load below the desired 2.5 TPA average.

Dobbes maintains that under 3.0 TPA is a sound crop load for vineyards in Willamette Valley. The source of Torii Mor's fruit (Medford-Ashland area) is in southern Oregon, however, where there's a different story because of increased heat units. With drip irrigation in these vineyards, yields are closer to 3.75 TPA.

Winemaker Sarah Powell at Foris notes that in the Rogue Valley of south-

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ern Oregon, there's frequently a need for irrigation. If deep, rich soils dry out, vines shut down. With irrigation, practiced as a vigor management tool, she does not believe that soil profiles are as important as when vineyards are unirrigated. When pressed to choose, clay-loam soils are preferred at Foris. Yields of 4.5 TPA shrink to 4.0 due to botrytis. This is OK since Powell has strived to obtain a honey character from botrytis in the wine.

As a point of reference, Medford-Ashland is high Region II. Compared with the Willamette Valley of northern Oregon, Medford-Ashland can consistently ripen Cabernet Sauvignon, Merlot, and Syrah — varieties which do not ripen in the Willamette Valley.

Dobbes adds that just referencing "southern Oregon" doesn't paint the full picture. Cave Junction, where Foris is located, is cooler than the Medford-Ashland area.

Cary notes that each year in northern Oregon can be radically different, but explains significant variations in yields at Yamhill Valley Vineyards. An original 2.3-acre Pinot Blanc vineyard is on a particularly vigorous site where yields have gone as high as 10 TPA for six-year-old vines. High yields are a result of the former stock pen on the site, more than vintage variation. On other sites, the TPA ranges from 2 to 3.5. Interestingly, the wine produced from high yields won awards. This encourages Cary to believe that wines will be even better as vigor is controlled on that small site.

"If I wanted to make a $10 bottle of Pinot Blanc," Cary maintains, "cropping to 10 TPA would be OK. But I'm trying to make concentrated, rich wines and dismiss large yields."

Pinot Blanc yields vary considerably year to year, Dobbes notes. In warmer and drier years in the Willamette Valley, vines can carry more. But projecting this at the beginning of the season requires a crystal ball. Seasons are more consistent in southern Oregon. It's like comparing Santa Barbara with Carneros.

Producers in the Willamette Valley do not yet know the consistent upper yield limit. They are therefore shooting at the lower limit of under 3.0 TPA because their sites are cooler, and if the overall season is cooler, they won't get the crop ripe.

"I've lived through vintages where we've run out of heat," Casteel contends. "If there's a large crop hanging, there's nothing you can do at that point."

Training and trellising

For bud fruitfulness, all participants prefer canes to cordon-training. All employ Vertical Shoot Positioning (VSP), with the exception of Torii Mor, which also utilizes the Scott Henry trellis. Bethel Heights prefers single Guyot and Amity prefers double Guyot.

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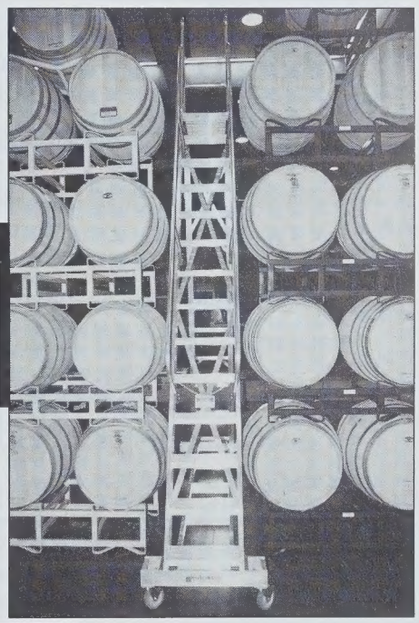

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Given the vine spacing to utilize single Guyot, Casteel is convinced it offers the best vine balance.

Scott Henry devigorates and promotes earlier ripening. In southern Oregon, more botrytis develops on VSP, which contributes to a desired style. In 1997, the decision to go with the Scott Henry trellis was made because its more open canopy can handle increased yield.

Irrigation

Casteel reports that for his hillside vineyard with Nekia (a volcanic soil in the Jory series with three-foot depth), he would like to have water available, especially at veraison. Willamette Valley summer drought conditions cause concern about insufficient water at that time of year. Drought conditions are believed to cause atypical ageing of bottled wine.

Typically, Willamette Valley gets shots of rain from September 15 on, with exponential increases in October. It's therefore necessary to keep crop loads low and to ripen grapes before autumn rains.

Powell explains that there's a phenomenal underground hydrological system below a myriad of soil types in the Rogue Valley. The extent of underground water sources and degree of clay in the soil impacts irrigation needs. Some vineyards need irrigation several times; others are irrigated only once, about mid-July.

"It's a big patchwork quilt with all sorts of circumstances," Powell continues. "There are also a number of soil types and water conditions brought about by an underground spring within a specific site."

Willamette Valley has extremely low rainfall during the growing season. In a dry year, where there is low spring rainfall, the worry is that once September comes, the soil is so dry that vines are stressed going into harvest.

Picking parameters

All producers have similar picking parameters: from 21° to 24.5° Brix, 0.60 to 0.70 TA and 3.1 to 3.5 pH depending on the vintage.

Additionally, Dobbes cites golden yellow berries and ripe melon flavors as indications of maturity. If weather factors permit in southern Oregon, he waits for "good" botrytis to develop.

Yet in the Willamette Valley, Casteel does everything he can to prevent botrytis development. That's because grape clusters are tight and susceptible to gray rot rather than "good" botrytis.

"If we in the Willamette Valley don't act to prevent botrytis development as much as possible, it can turn to gray rot at the end of one rain incident, since it's the same organism," Redford emphasizes. "An entire crop can be lost in a matter of four days. Humidity in the morning and warmth in the afternoon create beneficial botrytis, but rain and warm weather create grey rot."

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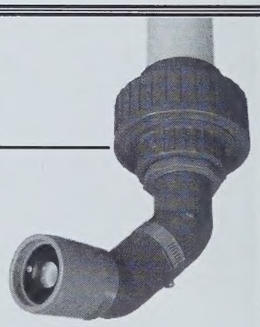

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Dobbes suggests that due to differences in heat throughout the growing season, Pinot Blanc skins in Willamette Valley tend to be thinner than in southern Oregon.

Cary notes that the true character of Pinot Blanc is discovered in years when there's little botrytis influence. Botrytis can add complexity, but it's the melon flavors that he seeks.

"Since we can't get beneficial botrytis on a regular basis in Willamette Valley," Redford reports, "if producers started to rely on it, the style would change each year. Brand identity depends on style consistency."

Since Pinot Blanc is a Pinot Noir mutation, botrytis is controlled the same way it is for Pinot Noir. That's through canopy management, leaf pulling, shoot positioning, preventing clusters from nesting, and limiting crop. Vineyard sites must also have good air flow.

Cary maintains that he has never had a botrytis problem with Pinot Blanc in his vineyards.

"Botrytis is not an issue in Pinot Blanc production unless one wants it to be," Powell says. "We could pick the fruit totally clean and ripe. But we don't. We wait because we want botrytis for the Foris style. Typically in our Rogue Valley vineyards, there is no rain during the harvest period until the last week of October.

"We can do this because the nights are cold, close to freezing. In a really hot year, like 1996, there was no botrytis. Don't be mistaken, we are not relying on botrytis to set a style; it's just a complexing factor. In years without botrytis, we use other winemaking techniques to achieve richness."

Nutrient depletion and amendments

After 15 to 20 years of vines planted on the same site, producers now realize that soils are becoming nutrient-depleted, particularly in potassium, nitrogen, and manganese. Decreasing yields are a clue.

"We have retrofitted old Yamhill Valley Vineyards and outfitted new plantings with irrigation for fertigation and to aid available nutrient transport to the vines," reports Cary. "This is not uncommon in Oregon, especially on some soils. We have found that our Yamhill Valley Vineyards mid- and upper clay slopes dry out the top 18 inches to two feet in dry summers. Below that, they remain moist, but the roots are largely in the upper layer and require summer water supplementation."

Some vineyard owners are taking Cary's approach and amending the soil through drip irrigation, while others have gone to composting or disking cover crops in alternate rows, every other year.

Dobbes has used a fescue cover crop on a valley vineyard to successfully

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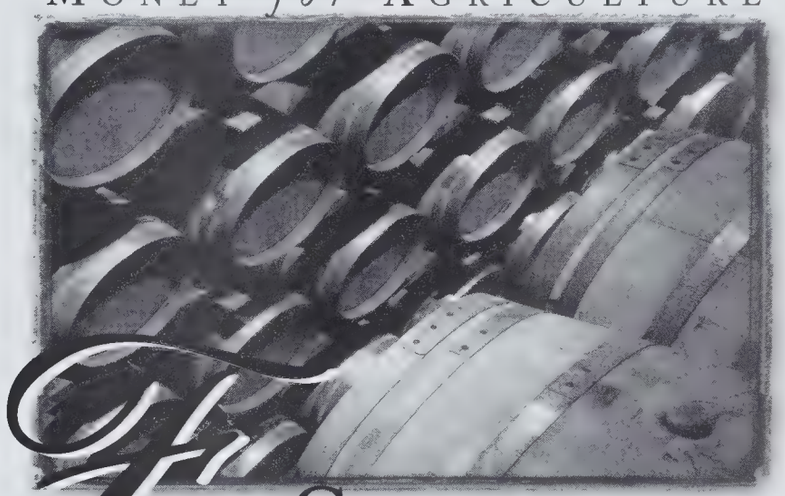

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devigorate vines and bring them back into balance.

Pinot Blanc at Foris is 100% estate grown. Changes have been made from the former practice of plowing under a vigorous, dense grass cultivated in alternate rows. Now, native grasses are allowed to form a cover crop.

Casteel notes that formerly cover crops were considered a medium to remove excess water from the soil in spring. And also as erosion control on hillside vineyards. He has moved more toward legumes planted in alternate rows as a way of bringing green manure into the vineyard, then plowing it under in spring. A cover crop is maintained throughout the year in one row, and disked under in the other.

Grape processing at the crush pad

All participants, except Redford, whole cluster press Pinot Blanc. Redford says, "Winemaking has fashions just like women's clothing. One year a woman wouldn't be caught dead in a skirt above her knees and the next year if its below her knees, no one talks to her. Skin contact for whites was *de rigueur* in the 1980s. Now you are looked at strangely if you don't whole cluster press."

Redford believes that like Riesling, a central issue for Pinot Blanc is balancing acidity. He does it by increasing the pH thru skin contact. He finds that about 12 hours is sufficient, "making the wine fatter and rounder," he notes.

Dobbes, however, prefers whole cluster pressing. It diminishes phenolics, and with fewer solids it minimizes lees filtration and the amount of waste to resettle. At Torii Mor, Dobbes barrel-ferments the must directly after pressing and without settling.

He has conducted fermentation with solids experiments to create better mouthfeel. "With southern Oregon fruit," he reports, "we have higher pH, (about 3.4), so skin contact is something we don't want."

Casteel believes that, with Pinot Blanc, a winemaker needs to confront the acidity issue in one way or another. When the pH at picking is about 3.4, it doesn't matter. When it's less, he wants the wine to go through MLF. He agrees with Dobbes' reasons for whole cluster pressing. Additionally, he says that it captures more fruit flavors.

Before Cary made a switch from crushed fruit to whole clusters, he conducted experiments. The control was whole clusters and whole berries bin-dumped into the press. For another batch, destemmed fruit was pumped into the press. He also made assessments of juice settling or not.

"By far," he reports, "the biggest influence on phenolics was from juice settling, compared to non-settling. Whole cluster pressing does reduce phenolics to some degree, but I'm not stuck on it. If a winery has a press that's hard to load, whole cluster pressing is too difficult. I do not see a decided advantage with whole clusters, bin-dumped or even pumped whole berries. A minimal gain in reduced phenolics is not worth the loss in efficiency."

Redford suggests another way to deal with phenolic issues. He ferments press wine and free run separately. Post fining trials, judgement is made on whether to blend the fined or unfined press wine with the free run. Employment of the method changes from vintage to vintage as blind trials are evaluated.

Primary fermentation and MLF

Issues of first addition of SO_2, MLF, and fermentation in tank or neutral cooperage differ for each winemaker. Some decisions are based on desired wine style.

Dobbes makes the first SO_2 addition after primary fermentation completes. He does not allow Tualatin Pinot Blanc to undergo MLF.

Cary adds 50ppm SO_2 at the crusher and inoculates for primary fermentation in both stainless tank and cooperage (10% to 12% principally new oak). MLF is encouraged, but the percentage depends on the nature of the fruit. Pinot Blanc Reserve is a "best fruit" selection that gets about 75% neutral cooperage and a greater completion of MLF.

In years when Casteel desires that the wine undergo MLF, SO_2 is not added until MLF completes. Bethel Heights Pinot Blanc goes through MLF spontaneously.

Dobbes suggests that if a winemaker allows polyphenyloxidases to do their job in the juice, with phenols dropping out during settling, wines end up fruitier and better able to age. Overall, there's less need for SO_2 later in the winemaking process.

Because there's significant botrytized fruit, Powell added 80 ppm SO_2 to freshly pressed juice. Without it, whole-cluster pressed juice would be a murky mess. In years without botrytis, only 30 ppm SO_2 is added.

Redford has experimented with Viniflora Plantarum, a new ML bacterium, from Chr. Hansen A/S. With it, MLF is induced in the juice by direct inoculation, before the alcoholic fermentation. Early assessment by Redford indicates that Viniflora Plantarum eliminates problems connected with spontaneous MLF. Its activity ensures a rapid biological deacidification, conveys biological stability, and offers less modification of wine flavor than other methods. The resulting wine retains greater fruity character, and because it does not produce diacetyl, has no buttery notes associated with traditional MLF.

Since Viniflora Plantarum is alcohol-intolerant, as the alcoholic fermentation proceeds, the bacteria are gradually eliminated. No living Viniflora Plantarum are present at the end of fermentation.

On the other hand, Casteel has not experienced loss of fruit character with traditional MLF following primary fermentation. He says he tastes the wine, and when it has balance, he adds SO_2 and stops MLF.

Barrel fermentation

Because Powell does not wish the wine to acquire barrel character, in years when the grapes are not botrytized, Pinot Blanc is fermented only in old puncheons. Barrel fermentation allows lees stirring for richness and complexity. When grapes are botrytized, fermentation takes place in stainless steel tanks.

The fat, rich, unctuous Torii Mor style is dictated by barrel fermentation. Dobbes contends that this decision marries the style to the fruit in its vineyard sources.

"Torii Mor is not trying to make another Chardonnay," Dobbes

explains. "But has attempted to give the wine more complexity; shooting for a different customer than those attracted to a stainless steel-fermented style. They, however, attempt to retain peach and pineapple fruit, characteristic of Pinot Blanc. They're pushing the style envelope."

Cary has made Pinot Blanc in both barrel and tank. After resisting for years and making it in stainless only, he has moved to partial use of cooperage and increased the percentage of MLF.

"When I taste the wines," he reports, "I like the wine made in barrels better. It doesn't taste like Chardonnay, but most of the time tastes better than tank-fermented." As production is increased, he will barrel-ferment Pinot Gris in the barrels first, then put the barrels into Pinot Blanc production.

Blending varietal

By law in Oregon, no more than 10% Auxerrois is allowed as a blending varietal for Pinot Blanc. On its own and picked at 22.5º Brix, about two weeks before Pinot Blanc, Auxerrois is a round, unctuous wine. In Oregon, it does not have an earthy component as it seems to display in Alsace.

With Willamette Valley grapes, winemakers are looking to Auxerrois, with its lower acid, higher pH, and elevated aromatics, to contribute richness, and a complementary kiss of toastiness for complexity.

Redford says he planted Auxerrois looking at an Alsace model. In a cool year in the Willamette Valley, where Pinot Blanc may not attain optimal ripeness, Auxerrois provides elevated aromatics and lower acidity.

Residual sugar

Depending on the vintage, Foris wine may retain some residual sugar.

In attempting to produce a balanced fruit-driven wine, Redford maintains that it may require leaving some residual sugar. If that's achieved by stopping the fermentation, some juice is retained, thereby increasing the fruit character. Additionally, it's a way of balancing acidity and phenolics in the wine.

Post script

With Pinot Blanc in Oregon, dedicated winemakers are offering a growing number of consumers what they say they are looking for — something different. Oregon winemakers are only two decades into learning how and where to grow the variety. As their vineyards age, each producer is developing a style expressive of site and personal preference for a delicious and pleasurable white wine. ■

PWV thanks Yamhill Valley Vineyards for hosting the discussion/tasting.

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Understanding grape berry development

BY James Kennedy, Department of Food Science & Technology
Oregon State University, Corvallis, OR

In the world of winemaking, there is a universal truth about the quality of the vintage: It is directly correlated with optimal grape maturity. Site selection and grapegrowing practices have a tremendous influence on achieving optimal maturity.

A considerable amount of viticultural research has identified strategies that can be used to optimize grape maturity at harvest including irrigation,[1,2,3] canopy management,[4-9] and cropping levels,[10,11,12] among others.[13-16] To fully appreciate how these strategies can be used to optimize grape maturity, grapegrowers and winemakers should have an understanding of berry development.

Fruit development

The grape berry is essentially an independent biochemical factory.[17] Beyond the primary metabolites essential for plant survival (water, sugar, amino acids, minerals, and micronutrients), the berry has the ability to synthesize all other berry components (for example, flavor and aroma compounds) that define a particular wine.

There is a potential for tremendous variability in ripening between berries within a grape cluster, and therefore within the vineyard.[18,19,20] Practically speaking, it is difficult to determine when a vineyard with a large variation in berry maturity is at its best possible ripeness. One of the major objectives of modern viticulture is to be able to produce a uniformly ripe crop.

If premium winemakers were to come up with what constituted the ideal, optimally ripe vineyard, it would be uniformly ripe clusters with small berries chock-a-block with flavor. An understanding of berry anatomy, when and where berry components are produced, is the first step in understanding the rationale behind managing wine style in the vineyard.

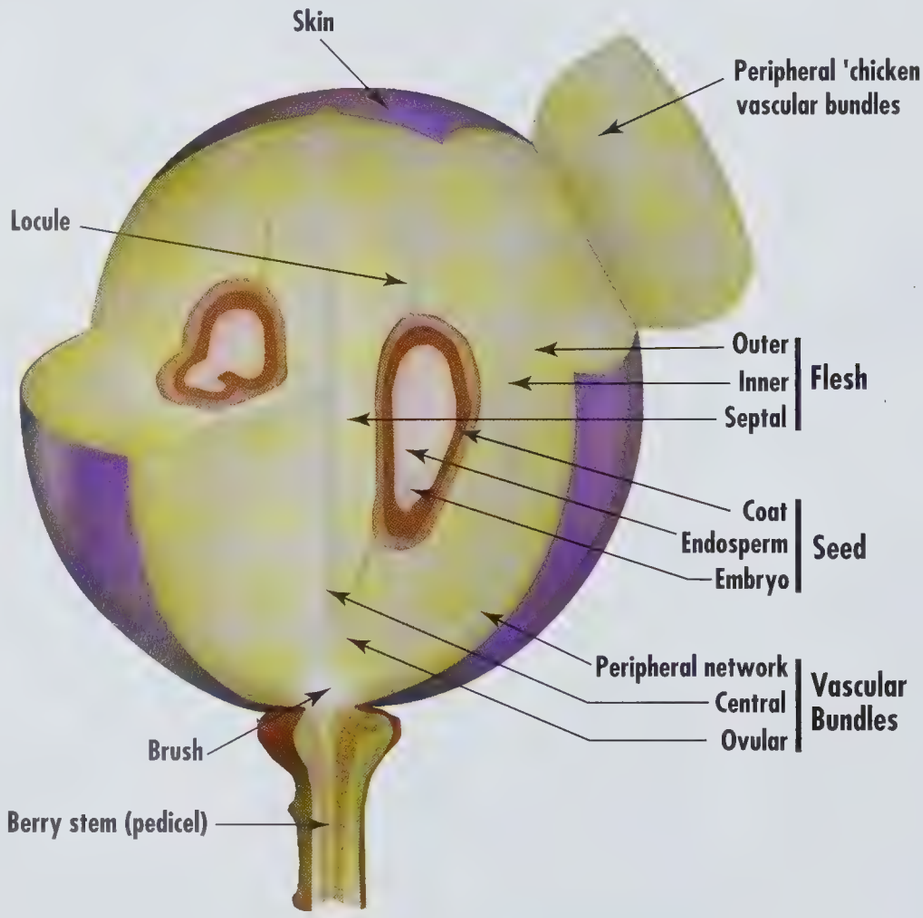

Figure I: Structure of a ripe grape berry partially sectioned on the long and central axis to show internal parts. Illustration by Jordan Koutroumanidis, Winetitles.

Berry structure

From a winemaking perspective, the grape berry has three major types of tissue (Figure I): flesh, skin, and seed, with the sheer bulk of wine being derived from the flesh. These tissues vary considerably in composition, and therefore by extension, they contribute differently to overall wine composition. Because of this, the composition of wine can be manipulated by simply changing berry size. As a general rule, wines made from smaller berries will have a higher proportion of skin and seed derived compounds.

In addition to the effect of berry size on the proportion of skin and seed-derived components in wine, the actual number of seeds in the berry can influence the proportion of seed-derived components in wine. The normal or perfect number of seeds in the grape is four;[21] in general though, the actual number is much less.

Environmental and nutritional conditions at bloom time affect the success of fertilization, and the resulting number of seeds per berry,[20,22,23,24] and therefore can be expected to influence the presence of seed-derived material in wine.

The berry is supplied through the berry stem or pedicel by a vascular system composed of xylem and phloem elements. The xylem is the vasculature responsible for transporting water, minerals, growth regulators, and nutrients from the root system to the rest of the vine. Current evidence indicates that xylem is functional in grape berries early in development (up to véraison), but afterward, its function is reduced or eliminated.[25]

The berry is also supplied by the phloem, which is the vasculature involved in photosynthate (sucrose) transport from the canopy to the vine. It has reduced function early in berry development, but becomes the primary source of ingress after véraison.[25]

Increases in berry volume (primarily water) are associated with increases in sugar after véraison. However, in some grape varieties (most notably Syrah), sugar increases during the latter stages of fruit ripening are not accompanied by increases in berry volume, but are caused by berry shrinkage. This shrinkage appears to be due to the transiprational loss of water,[26,27,28] suggesting that the inability of the berry to stay well-hydrated at this point is due to blockage of phloem elements into the berry. This indicates that, for some varieties, the vasulature between the vine and the berries has reduced function during late season fruit ripening.

Development during first growth period

Berry development consists of two successive sigmoidal growth periods separated by a lag phase (Figure II).[18] The first period of growth lasts from bloom to

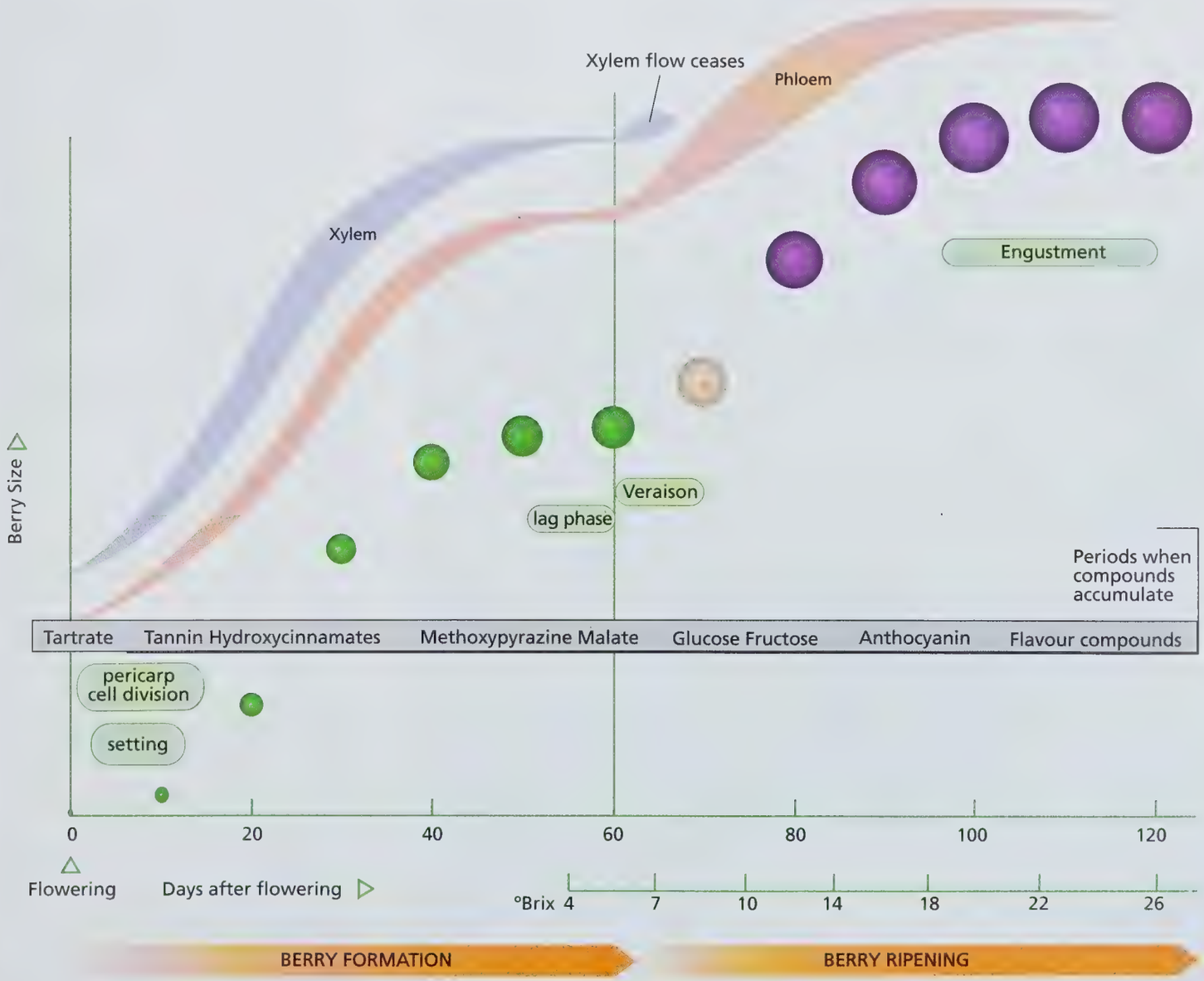

Figure 2: Diagram showing relative size and color of berries at 10-day intervals after flowering, passing through major developmental events (rounded boxes). Also shown are the periods when compounds accumulate, the levels of juice °brix, and an indication of the rate of inflow of xylem and phloem vascular saps into the berry. Illustration by Jordan Koutroumanidis, Winetitles.

approximately 60 days afterward. During the first growth period, the berry is formed and the seed embryos are produced. Rapid cell division occurs through the first few weeks, and by the end of this period, the total number of cells within the berry has been established.[29] The extent of cell division has some bearing on the eventual size of the berry.

Also during the first growth period, the berry expands in volume as solutes accumulate. There are several solutes that accumulate in the berry during the first growth period, all of which reach an apparent maximum around véraison.[30] By far the most prevalent among these are tartaric and malic acid.

These acids are distributed in the berry somewhat differently, with tartaric acid being highest towards the outside of the developing berry, and malic acid being highest in the flesh. Tartaric acid appears to accumulate during the initial stages of berry development, and malic acid accumulates just prior to véraison. These acids provide wine with acidity and are therefore critical to wine quality.

Also accumulating during the initial period of growth are the hydroxycinnamic acids.[31] Hydroxycinnamic acids are distributed in the flesh and skin of the berry and are important because of their involvement in browning reactions, and because they are precursors to volatile phenols.[32]

Tannins including the monomeric catechins also accumulate during the first period of growth.[33,34] Tannins are present in skin and seed tissues and nearly absent in the flesh, and are responsible for the bitter and astringent properties of red wine. These compounds are also believed to be important in red wine color stability.

There are other compounds that accumulate in the berry during the first phase of growth, and which have importance to wine quality. Minerals,[30] amino acids,[35] micronutrients, and aroma compounds (such as methoxypyrazines[36,37]) have all been observed during the first period of berry growth.

Our understanding of berry formation and development during the first period of growth and of the production of compounds having sensory importance is still developing. Understanding berry formation and the factors that affect its formation is still limited because of the complex nature of this type of research.

Understanding berry development and its compositional changes during the first growth period is limited probably because the compounds produced are thought to be of less interest from a sensory standpoint. It should be remembered though, all compounds discussed above are critically important to wine quality.

Development during second growth period

The beginning of the second phase of berry growth or fruit ripening (véraison) is characterized by softening and coloring of the berry. Overall, the berry approximately doubles in size between the beginning of the second growth period and harvest. Many of the solutes that accumulated in the grape berry during the first period of development remain at harvest, yet due to the increase in berry volume, their concentration is reduced significantly.

Some compounds produced during the first period of growth are reduced on a per-berry basis (not simply diluted) during the second period of berry growth. Principal among these is malic acid. Its reduction varies considerably but can roughly be correlated with climate. That is, grapes grown in warmer regions tend to have less malic acid than those grown in cooler regions as a result of this reduction.

Tannins also decline considerably on a per-berry basis during the second period of growth. The reduction in seed tannin appears to be due to oxidation as the tannins become fixed to the seed coat.[38] As a result of this, the composition of extracted seed tannins changes considerably, and is characterized by a proportional reduction in the most bitter tannin components.

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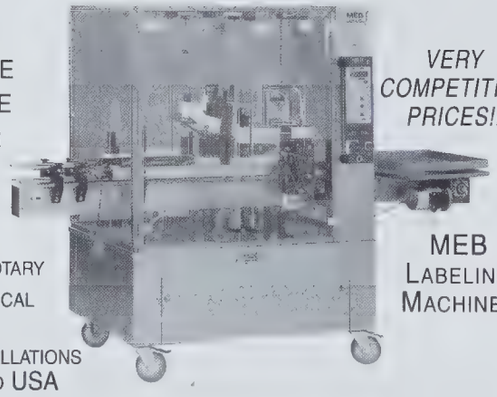

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Skin tannins decline or remain constant during the second period of growth, and also become modified. Significant modifications that take place for the skin tannins include an increase in their size. Also of potential significance from a wine quality standpoint is evidence that extracted skin tannins are modified with pectins and anthocyanins.[33] This could make berry development an important consideration in the areas of wine texture and color stability.

Notable aroma compounds that are produced during the first period of growth, decline (again, on a per-berry basis) during fruit ripening. These include several of the methoxypyrazine compounds that contribute vegetal characters to some wines (such as Cabernet Sauvignon and Sauvignon Blanc).[39] The decline in pyrazines is thought to be linked to sunlight levels in the cluster. Therefore, if these compounds are deemed to be undesirable (the current prevailing opinion), then canopy management can be used to reduce them.

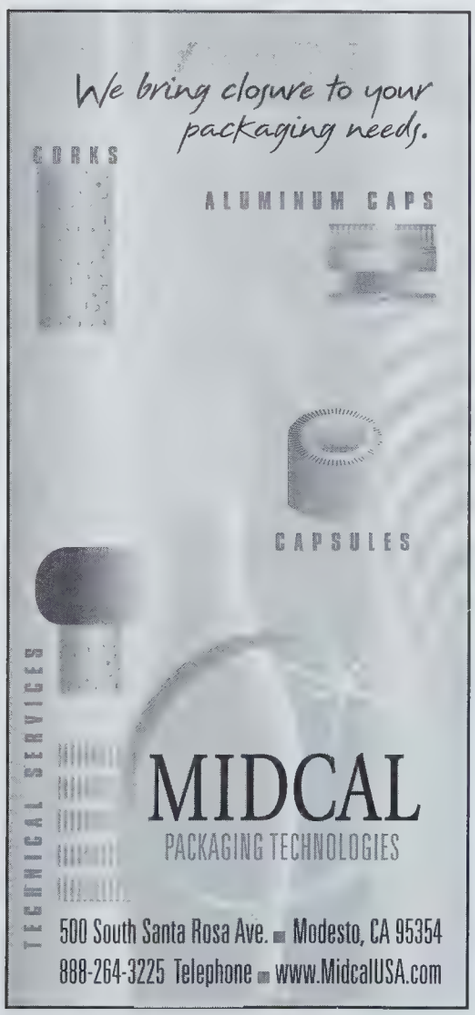
Despite these major changes in compounds produced during the first growth period, the big story during the second growth period is the tremendous increase in compounds (the major ones being glucose and fructose) that occurs as a result of a total biochemical shift into fruit ripening mode.

Beginning at véraison, sugar influx into the berry commences. Sucrose produced from photosynthesis is imported into the grape berry during fruit ripening. Once transported into the berries, the sucrose is hydrolyzed into its constituent sugars glucose and fructose.[40] Their eventual concentration is dictated partly by the length of time the grape berry is allowed to stay on the vine. (Other factors include the crop load, canopy size, disease status, and as mentioned earlier, dehydration).

Beyond sugar accumulation, the major determinants of a wine's quality are the secondary metabolites. In red grape varieties, anthocyanin production (restricted to skin tissue in most cultivars) is probably the most obvious compound of importance, but as with white varieties, most of the volatile flavor components are produced during fruit ripening.[41–45] These would include such compound classes such as terpeneoids, which are important to the pleasant aroma of many varieties, such as Riesling and Muscat, and fruity aroma precursors. Aroma compounds are distributed in the flesh and skin of the berry.

In addition, many other important aroma and flavor compounds are produced late in fruit ripening. Some of these components are produced as precursors, and are not actually volatile until after the wine has been produced and aged for some time.[46] Nevertheless, their precursors are present in the grape as glycosides, and the period of time where many of them appear to be produced has recently been given the term "gustation."[47]

In examining berry development, it helps to look at it from an ecological perspective. If the *raison d'être* for the berry is to reproduce, then its first pri-



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ority is to develop a viable seed. During the first period of growth the berry does just that. It develops a viable seed and produces compounds to protect it while doing so.

If you think about the compounds that are produced during the first period of growth (organic acids, tannins, pyrazines), they combine to make foraging by birds and mammals a downright unpleasant experience. By the end of the first period of growth, a viable seed has been produced, and therefore, the goal during the second period of berry growth is to make the berry as appealing as possible to birds and mammals so that seed dispersal can occur.

Conclusion

Many advances have been made in understanding of how the grape berry develops and of the components that are important in wine. No doubt the quality of our wines has improved as a direct result of being able to manipulate the grape berry through production practices.

Understanding when various components accumulate in the berry is critically important to understanding how grapegrowing practices can be used to modify wine style. It is clear that this is an area of research that will continue in the future, yet it is already apparent that a winemaker can influence wine style through grapegrowing practices. The trick is understanding the what, when, and how of berry manipulation. ■

Illustrations provided by Australian Viticulture *from text: "Ripening berries — a critical issue" by Dr. Bryan Coombe, (Honorary Visiting Research Fellow, Adelaide University, Australia) and Tony Clancy (Editor,* Australian Viticulture*), March/April 2001. Illustrations prepared by Jordan Koutroumanidis.*

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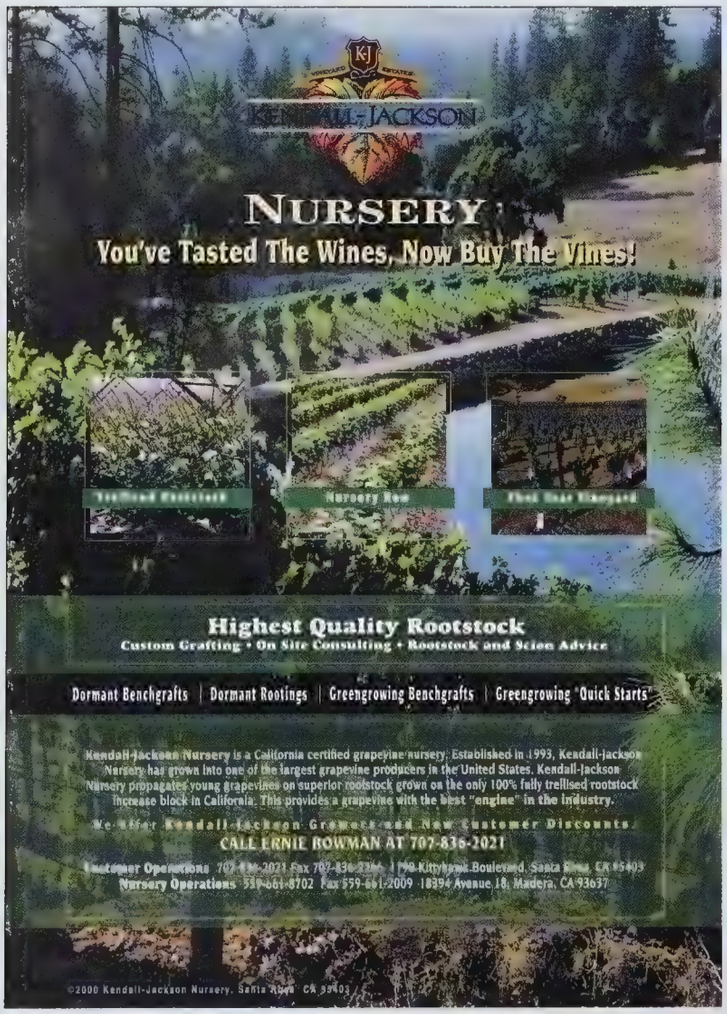
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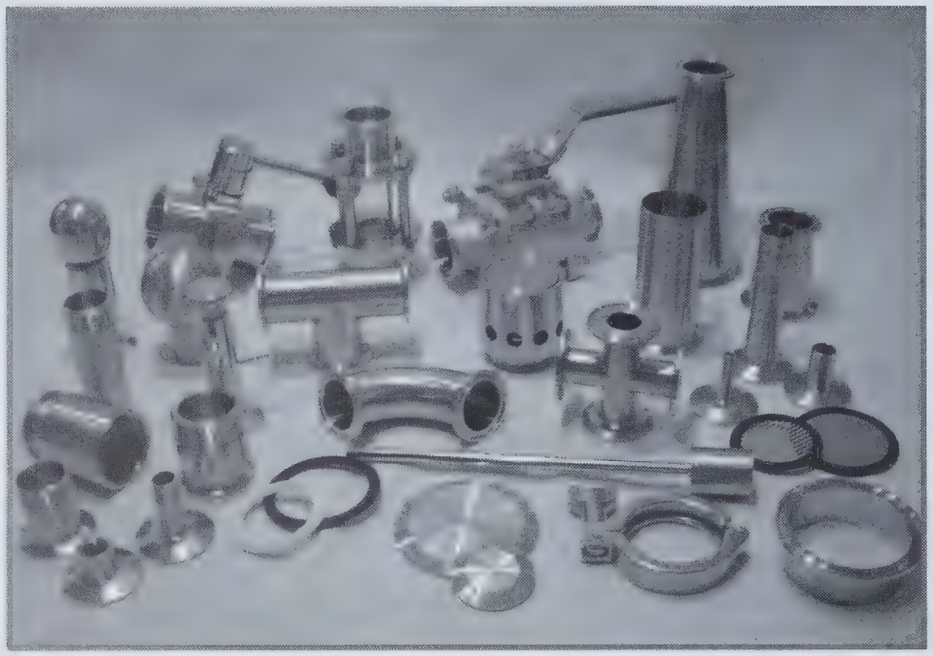

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Marriage of ambiance and simplicity at Sanford Winery

BY Deirdre Booth
Summit Engineering, Inc.
Santa Rosa, CA

To understand winemaking is to understand that wines are, basically, a function of chemistry and physics. Winemakers put the reins on natural processes to impart a personal style into their wines. However, the product is not the result of any one person's sole input, but of many individuals and processes coming together to create a product with its own unique character and taste.

Just as winemaking requires the careful blending of many individual skills and processes, so does the construction of winery facilities. An example is the new Sanford La Rinconada Winery in the Santa Ynez Valley (Santa Barbara County). The facility is the culmination of Richard Sanford's dream, Bruno D'Alfonso's winemaking needs, and the creativity and skill of numerous people involved in the project: the architect, engineers, timber framers, carpenters, stone masons, and metal workers.

With its handwrought adobe materials, sustainable infrastructure, use of recycled wood, lack of cumbersome equipment, recycling of wastewater and solid waste, and its natural temperature and humidity control, Sanford La Rinconada is a testament to the arts of winery design and winemaking. The facility was designed to create wine in a nature-inspired atmosphere while addressing the winemaker's need for simplicity and efficiency.

Designing a winery

When laying out the winery, the design team had to stay true to Richard Sanford's winemaking and environmental convictions. The overall design of the facility reflects Sanford's love of the earth and interest in feng shui. Sanford describes the facility as a "winemaking campus" due to its unique layout of separate, distinct buildings and open spaces.

The design of the winery, from sitework and mechanical systems to architectural and structural engineering, was uniquely challenging for the design team. Design team member Steve Martin (Summit Engineering, Inc., Santa Rosa, CA) states, "Though we've worked on over 200 wineries, Sanford was enjoyably different than any we've been involved with. Richard's creativity, coupled with his enthusiasm and congeniality, was encouraging to us all. He had a strong mental picture of what the winery should be, both visually and atmospherically. He truly led the winery design."

Many challenges faced the design team. Among those were multiple phases of construction, production spaces located in separate buildings, hydraulic gravity tanks, and adobe and block construction.

Once all phases of construction are completed, there will be 87,000 square feet of buildings across eight acres. Central to the facility is an open air courtyard area. This is the hub of the operation, where the winemaking begins with grape receiving and where visitors begin experiencing the winery. The layout encourages visitors to meander and mingle, as opposed to steering them directly into the tasting room.

Surrounding the courtyard area are the red wine fermentation area, barrel rooms, storage, shipping and receiving, administration offices, winemaker's lab, equipment workshops, parking structures, worker housing, and tasting room. The facility design and use of gravity mean that less pumping and equipment are required, resulting in less impact on the wine and more efficiency in the facility.

Materials make a statement

The winery resembles a classic California mission due to the use of adobe blocks. The brick recipe formula includes 50% Rinconada soil, 40% rock dust from a local quarry, and 10% concrete sand. Adobe blocks are produced on site and utilized throughout the facility.

Just as visually impressive as the brick, the timbering for the winery utilizes early 20th century first-growth Douglas fir that Sanford reclaimed from an abandoned sawmill he purchased in Klickitat, WA. Five hundred thousand board feet were dismantled and hauled by truck to the winery site. At an onsite sawmill created just for this purpose, the lumber was re-milled into what are now the winery beams, siding, stairs, handrails, and doors, cre-

Sanford La Rinconada Winery's "winemaking campus," includes the red fermentation building (L) and the chai or barrel and tank building (R).

ating a unique and impressive complement to the adobe.

The combination of brick and wood ties the facility to the earth, thus allowing those who visit and work there to experience Sanford's vision first-hand.

Winemaking

While Sanford's convictions drove the facility design, winemaking-facility decisions were left to Bruno D'Alfonso and his crew. D'Alfonso has been making wine for 22 years, 19 of them at Sanford Winery. His close-knit crew (compromised of three brothers and two brothers-in-law) has been with him most of that time.

Anyone who has met D'Alfonso can testify to his no-nonsense style. Although he has been producing premium wine for two decades, he does not take himself or winemaking too seriously.

D'Alfonso describes his working style as simple and practical, and it is reflected in his use of the facility, which produces primarily Pinot Noir and Chardonnay, a small amount of Sauvignon Blanc, and a dry Rosé. About 30 to 40 tons of grapes are processed per day, for a total production of 50,000 cases per year.

Sanford started his winemaking operation 30 years ago, putting his sweat equity into the vineyard, while healing himself by being close to the earth after his tour of duty in the Vietnam War. From the beginning, he has worked closely with the vineyard crew, from driving a tractor to overseeing vineyard operations.

The vineyards are spread out over four different ranches — Rancho El Jabali has seven acres (half Chardonnay and half Pinot Noir), Rancho La Rinconada has 130 acres (60 Chardonnay, 60 Pinot Noir, and 10 Sauvignon Blanc), Rancho La Vina has 100 acres of Pinot Noir, and 135 acres at Sanford & Benedict Vineyard (60 Pinot Noir, 52 Chardonnay, and a mixture in 23 acres).

The harvest crew has now grown to 60 people, each of whom is integral to the creation of the wine as they hand-pick and sort the grapes. Hand-picking allows the winery to be selective in the field, choosing the right grapes at the right time. The crew may even do a sec-

Reclaimed first-growth Douglas fir highlights the winery throughout in details like the door and ceiling of this barrel room.

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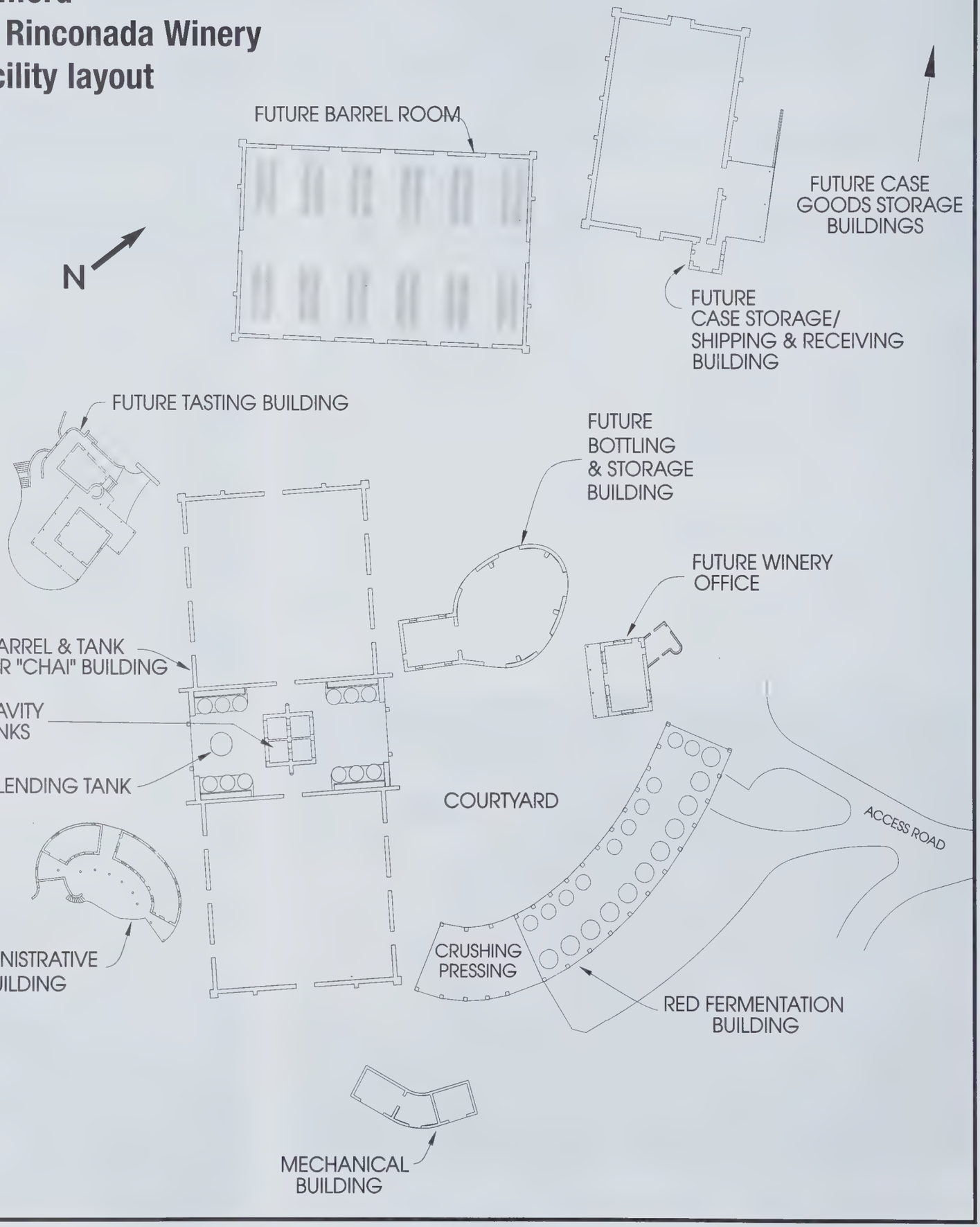

Gravity winemaking

Richard Sanford bases his winemaking philosophy on "Being gentle on the product once it becomes wine," implying that it is not as critical to be gentle on the product before it is wine. Once it becomes wine, however, it has more potential for bruising and oxidation, which can be exacerbated by pumping.

In order to avoid pumping the wine, the winery utilizes gravity tanks. The tanks are raised and lowered independently, by means of an electric-powered hydraulic system. Transfer between tanks, or to barrels, is accomplished with one-inch hoses. Transport from the red fermentors involves the longest distance at just under 300 feet (barrels are generally within 100 feet).

Four 3,600-gallon tanks are used for the gravity-flow style of winemaking Sanford adheres to, and pumps are avoided once the wine leaves primary fermentation. A concrete vault in the form of a cross holds the four tanks in a cavity that extends 20 feet below ground.

The tanks (designed by Summit Engineering, Inc., and built by Westec Healdsburg, CA) are mounted on top of a hydraulic lift system, which includes a piston (with top bearing plate), guide rails, and stiles. They have integral stiffening to resist seismic lateral loads and gravity load and to resist impact on the guide rails during a seismic event.

Ring stiffeners have been provided to resist the lateral impact in bending and compression (ring direction is limited to less than one-half-inch).

Vertical shear transfer is provided by the cylindrical tank shell. The tank base is designed to resist lateral and gravity loads and is supported vertically by the lift piston located at the centerline of the tank.

ond pass on a vineyard block in order to allow all the grapes enough time to reach maximum maturity. Hand-picking eliminates juicing in the field, leaving the fruit as whole as possible before whole-cluster pressing.

White wines

The courtyard is the grape receiving area where grapes arrive in half-ton bins and are weighed. From the scale, bins are lifted by forklift into a homemade hopper that feeds directly into a Keisel progressive cavity pump.

The homemade hopper is portable and inexpensive, fashioned from wood. It has an open top for feeding and a hole in the side to allow a worker to manually feed the grapes with a hoe into the pump.

White grapes are handled to promote early oxidation of fragile phenolic compounds. Grapes are pumped directly into an 8000L Europress. D'Alfonso does not destem white (Chardonnay and Sauvignon Blanc) grapes; rather he pumps whole-clusters to the press. Both the press fraction and free run are pumped to a 3,600-gallon tank where the juice is chilled overnight. Then it is racked either to barrels or other tanks for fermentation.

The tanks are housed in the Chai building, located to the south of the courtyard. This building also contains the unique gravity tank tower and two barrel rooms. The Chai building is roofed, but only walled on two sides to provide weather protection. The open space design provides more accessibility in the tank area and also creates a natural ambiance by bringing the vineyards right into the facility.

The ambient temperature and humidity in the barrel rooms are controlled by the combination of the adobe bricks comprising the walls of the structure and the insulation used. Mother Nature assists by providing significant diurnal temperature fluctuation and plenty of nighttime fog in the west end of Santa Ynez Valley.

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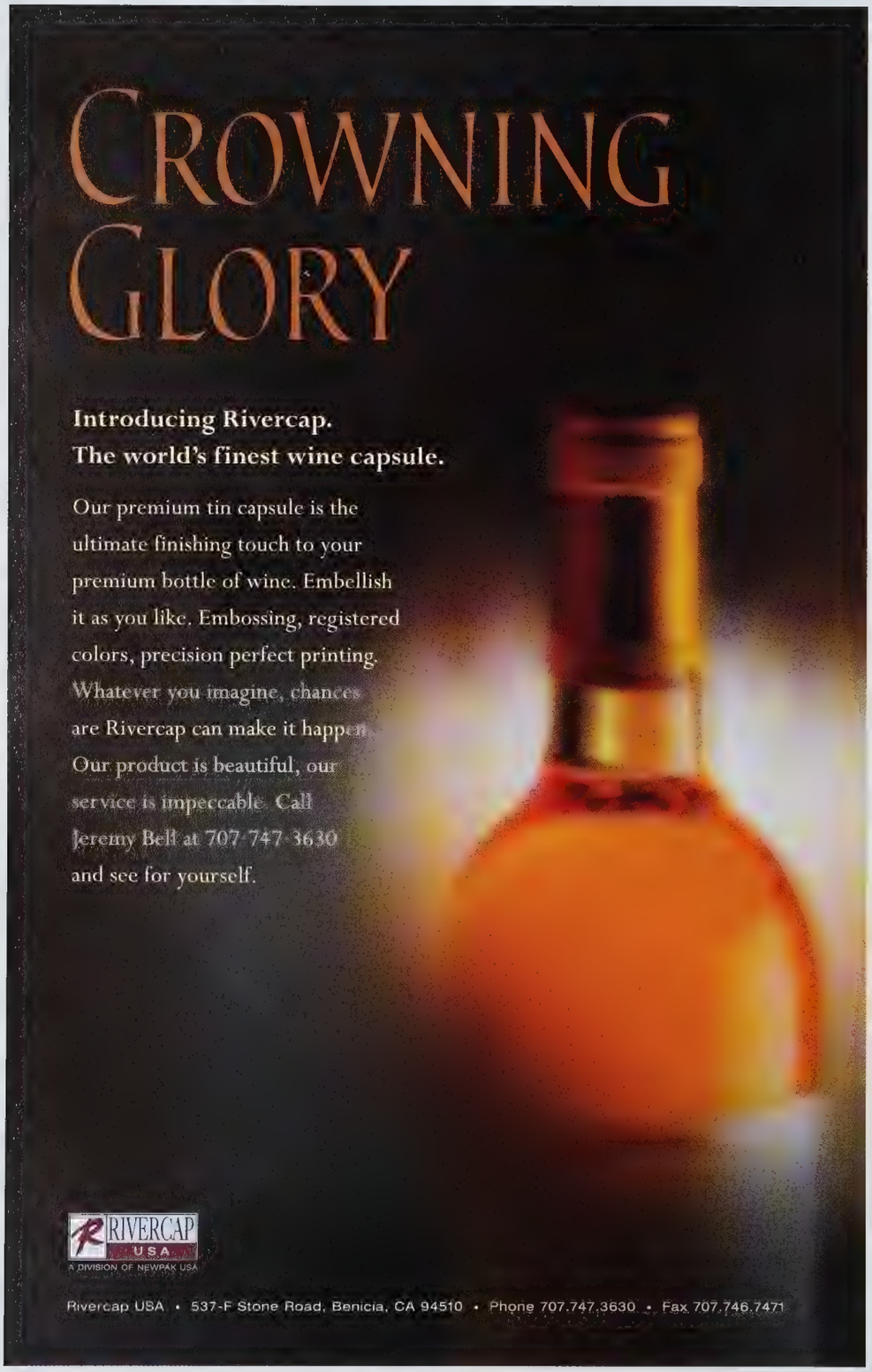
After 12 to 18 months ageing, Chardonnay is racked from barrels and blended. After racking, the wine undergoes fining and cold stabilization. Vineyard-designated whites are not filtered. The Santa Barbara County label wine is filtered, including a polish filtration with a Zeitz crossover plate filter and sterile filtration with a Pall membrane at bottling.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Red wines

Just like the whites, red grapes are sorted and hand-picked in the vineyard and received in half-ton bins, weighed, and forklift-dumped into a 15-ton/hour Amos crusher/destemmer. The crusher rollers are open, so whole berries remain as intact as possible. Grapes fall into bins, which are then lifted and dumped into one of 21 open-top seven- or 10-ton fermentors. Each red fermentor sees two turns each year. The red fermentation building, located to the northeast of the courtyard, has no walls, allowing the CO_2 to fully escape from the fermentors.

The must is cold soaked for two days at 50°F to promote aqueous extraction of color compounds. During this time, the must receives an addition of Color Pro enzyme and is inoculated with cultured yeast.

After the cold-soak period, the grapes begin fermentation, which includes manual punchdowns. A cellar worker manually punches the cap into the wine twice per day. Maximum red fermentation temperature is kept below 90°F.

When fermentation is completed, the wine is screened and drained through hoses into the custom-designed gravity tanks. (See sidebar page 27.) The top of each gravity tank can be lowered to 18" below grade to accomplish the draining. It requires five to seven hours to fully drain a fermentor.

The tank is then raised up to 12 feet above grade by an electric-powered hydraulic system, and the wine is gravity-fed into barrels where it ages

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for nine to 12 months and completes malolactic fermentation.

Fermented grape skins are collected in half-ton bins and loaded into a 5000L Europress that has been modified by lowering the first inflation to 0.1 bar. All remaining pressure levels are defeated. D'Alfonso sets the repeat cycle to five. This is done to reduce broken seeds and reduce the extraction of bitter or herbaceous compounds.

Press wine is separated and evaluated for the appropriate blending and ageing program. After malolactic completes, D'Alfonso adds SO_2 and puts the wine back to the barrels for six to eight months (to complete 18 months of ageing).

The gravity tanks may once again be utilized in the racking and final blending process. They are lowered below grade to allow the wine to flow through hoses back into the tanks.

Historically, the wine has not required final filtration due to the specialized racking process and the enzymes D'Alfonso adds during fermentation. The wine remains in tanks for up to one month to allow for final settling before bottling.

The bottling building will be built in the near future. It will be partially open for arriving bottles and departing cases, while the rest of the building will be totally enclosed for the bottling line itself.

Wastewater

As with all winemaking facilities, collection, treatment, and disposal of the generated process wastewater is critical. Summit Engineering, Inc., (Santa Rosa, CA) designed Sanford's wastewater treatment system according to the owner's desire for the facility aesthetics to work with the environment.

"We took special care to make sure that the process wastewater system was environmentally sensitive and designed to blend with the natural terrain and to provide excellent treatment, disposal, and reuse of the reclaimed wastewater," explains Martin.

The process wastewater treatment system consists of initial screening, a gravity collection system, flow measurement, rotary drum screens to remove gross solids, pH neutralization (if necessary), and lined, aerated ponds to reduce organic loading.

At Rancho La Rinconada, the water is then applied by spray or

Continued on page 71

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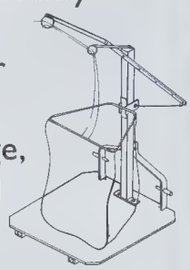

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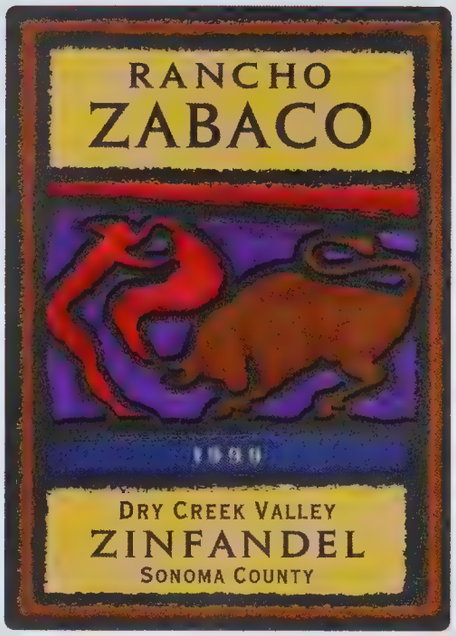

BY Rhoda Stewart

Rancho Zabaco is the Gallo family's recently established Zinfandel brand produced at the Gallo of Sonoma facilities in Healdsburg, CA. The brand is named for one of the original Mexican land grants in Sonoma County — Tzabaco Rancho. Rancho Zabaco is currently producing five Zinfandels:

- Dancing Bull (production about 90,000 cases)
- Sonoma Heritage Vines (60,000 cases).
- Dry Creek Valley (22,000 cases)
- Stefani Vineyard (approximately 3,900 cases)
- Chiotti Vineyard (approximately 2,100 cases).

The wines range in price from $12 for the Dancing Bull to $25 for the two single vineyard wines.

When I met Rancho Zabaco winemaker Eric Cinnamon, my first question was: Why did Gallo of Sonoma want to establish a second label on the Dry Creek Valley premises? Gallo of Sonoma itself produces two Zinfandels: Frei Ranch and Barelli Creek. What is the advantage in establishing a new Zinfandel-based label?

"Rancho Zabaco Zinfandels provide consumers with the best of both worlds. The wines have intensity of flavors and wonderful texture and are also a good value," replies Cinnamon. "These wines are made to appeal to the new, younger wine drinkers in the 21st century."

According to Cinnamon, Rancho Zabaco's status as a stand-alone Zinfandel-based brand has allowed it to develop a distinctive house style of Zinfandels. "We have a range all the way from Dancing Bull, which has a simpler structure and is more immediately approachable and enjoyed in a variety of occasions, up to the single vineyard Zinfandels, which have more intensity, texture, and complexity. With these five Zinfandels, we provide an entire scale of wine-drinking experiences.

"The single vineyard Frei Ranch and Barelli Creek Zinfandels produced under the Gallo of Sonoma label have a little more elegance and, perhaps, are a little more restrained than the style we are creating with Rancho Zabaco.

"The Frei Ranch is located within the original Tzabaco zone, but it traditionally has been associated with Gallo of Sonoma. We did not think it worthwhile to try and repackage it under the Rancho Zabaco label. Barelli Creek is in Alexander Valley."

Cinnamon was promoted to winemaker for Rancho Zabaco in November 2001 after working at Gallo winery for four years. "You could think of Gallo of Sonoma as the custom crush facility for Rancho Zabaco. The advantage to me is that I have access to state-of-the-art technology and equipment, yet I have the freedom to develop a distinctive style for the Rancho Zabaco wines," Cinnamon explains. "The wine styles are non-traditional and very different from Gallo wines.

"Julio Gallo's favorite wine grape variety was Zinfandel, and therefore he had Zinfandel planted in Dry Creek Valley on family-owned vineyards located in the heart of the Zinfandel Zone, Dry Creek Valley. It is considered the world's best Zinfandel-producing region."

"How could we not focus on Zinfandel?" exclaims Kristina Belfield, senior marketing manager, when asked why the family decided to establish a Zinfandel-based stand-alone brand.

"Joe Gallo, CEO of E&J Gallo and Ernest Gallo's son, is the big Zinfandel supporter in the family today," continues Belfield. "Julio loved Zinfandel; he was the first, but Joe was one of the first in the Gallo family to see the potential for developing a Zinfandel-based brand devoted to producing exciting, showy, voluptuous Zinfandels with explosive up-front fruit. These wines are meant to be playful and fun.

"Zinfandel really does have a unique flavor profile and has an almost cult-like following. Zinfandel took off as an alternative to Cabernet Sauvignon when Cabernet prices started increasing dramatically in the mid-1990s. Gallo had wonderful Dry Creek Valley Zinfandel, the market was right, and the passion was there. Thus Rancho Zabaco was born."

In order to emphasize the playfulness of the wines, the colorful bull image for the label was selected from an original painting by Modesto artist David Garcez. The bull reflects the Mexican-American history of Tzabaco Rancho and also suggests a colorful

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Rhoda Stewart, author of A Zinfandel Odyssey, *published by* **PWV** *Inc. San Rafael, CA, © 2002, revisited Gallo of Sonoma to learn about Gallo's new Zinfandel brand.*

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past and a strong, masculine image — all of which are components the family strives to produce in its robust Rancho Zabaco line.

"Dancing Bull was selected as the name for the low-end blend. It does carry a California designation, but the name Dancing Bull gives the wine its own personality," Belfield explains. "It enables us to source fruit from regions outside Dry Creek Valley such as Lodi and Paso Robles."

Winemaking practices for each of the wines are suited to the style and character of the wine being produced. But for each the goal is to produce wines that are filled with intense up-front fruit flavors and soft, approachable tannins.

Grapes for Dancing Bull Zinfandel are gently destemmed, and then fermented in upright stainless steel fermentors for four to seven days between 80° to 92°F. Each fermentor is equipped with a pump controlled by a timer. The timer is set for frequent pumpovers, or irrigations, in order to maximize early extraction of flavor and color.

When fermentation is complete, the wine is put into mostly used or neutral (one to three-year-old) American oak barrels for about four months to achieve mellowness and depth, while preserving its bright, fresh fruit. Nearly 100% of the wine completes malolactic fermentation. Non-Zinfandel grapes (7% Petite Sirah, 5% Syrah, 2% Cabernet, and 4% other varieties) comprise 15% of the blend.

The Heritage Vines Zinfandel is made entirely from Sonoma County fruit — 76% Zinfandel and about 24% Petite Sirah and Syrah. The fruit is handpicked, and then gently destemmed, leaving from 20% to 30% whole berries. Whole berries provide a bright, up-front red raspberry fruit.

After three to four days of fermentation between 85° and 88°F, with frequent pumpovers by a timed pump to bring out a zesty character of the Zinfandel grape, the wine is racked into mostly used and neutral (one to three-year-old) barrels — American, French, European — where it completes malolactic fermentation. It is bottled after about eight months.

The Dry Creek Zinfandel is entirely from Dry Creek Valley fruit, a region often referred to by the locals as the "Zinfandel Zone." Minimally destemmed in order to leave some whole berries for bright fruit flavors,

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the must is gently delivered to upright fermentation tanks.

After fermenting to dryness, the wine remains on the skins for five days to extract big ripe flavors. Then it is racked into 20% to 25% new American oak barrels, in keeping with classic Zinfandel style, for 10 to 12 months. American oak adds a distinctly smoky, vanilla component. It completes malolactic in the barrels, and then is bottled unfined, with only a minimal filtration.

The Chiotti Vineyard is located at the far northern end of Dry Creek Valley, on an eastern bench slope just below Lake Sonoma. This 60-acre vineyard was planted to Clone 101 Zinfandel in 1992, a small berry clone that produces rather loose, straggly clusters. "We like it because it gives more concentration of color and spices," notes Cinnamon.

Vines are on various rootstocks, trellised, and drip-irrigated. "We like irrigation, that is, intelligent irrigation," suggests Cinnamon. "We do a lot of work with the pressure bomb on the leaves, to really know when the vines are becoming stressed. Then we go to metered application of water, to keep the vines going, so they do not wilt, and so that the grapes do not turn to raisins. Intelligent use of irrigation gives us control."

The soil in the Chiotti is gravelly clay loam, which contributes to a unique flavor profile that is expressed in the wine in velvety layers of wild blueberry and blackberry fruit. Fruit from just a few acres on the higher slopes is used in the Chiotti Vineyard Zinfandel.

Cinnamon likes much about this vineyard and its suitability to the style of Rancho Zabaco Zinfandels. "It is on a bench, with nice, rich soil. The benefit is that the clay-based soil holds water, so that the vines do not get zapped by the summer heat. They don't shut down and wilt as easily, so that you get full mature ripeness, not ripeness and sugar by dehydration. That is a big benefit. It enables us to push for full physiological ripeness, which gives the wine intense black cherry and blackberry flavors."

Viticulture practices include leaf removal on the north side of east/west rows, and the morning (east) side of north/south rows, and shoot and cluster thinning. Ripe clusters are meticulously hand-harvested at an average 25° Brix.

"When we bring the fruit into the winery, the fruit is just gently destemmed, and then put into rotary fermentors, to extract color in the wine quickly. The benefit of this handling is that we get all the color and flavors that we need at about 10° to 8° Brix. Then we take the wine off the skins, keeping in mind our vision to maximize the fruit from the Chiotti Vineyard and minimize tannins.

"From the rotary fermentors, the wine is transferred to a tank press for pressing and draining to an upright tank, where it finishes fermentation. It is racked again, then goes to barrels, 20% to 40% of which are new French — depending on the year. Other barrels are used French and Hungarian.

"Malolactic fermentation occurs in the barrels within two to four months. After malolactic, it is again racked and SO_2 adjusted as necessary, and returned to barrels, then topped throughout the spring and summer.

"We take it out of barrels in July, after about eight months, and bottle in

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August. This is done to preserve the rich fruit, which we do not want to die in the barrels, or become over-oaked. That is why we use French and Hungarian oak. These barrels are much sweeter than American oak, and tend to prop up, or elevate the fruit. They do not compete with the fruit."

The Chiotti wine is normally pad-filtered.

Stefani Vineyard Zinfandel

The flip side of the Chiotti Vineyard is the 200-acre Stefani Vineyard. Located in the heart of "Canyon Valley," a unique southwest-northeast corridor connecting Sonoma County's Dry Creek and Alexander valleys, the vineyard is on rolling hillside, in a kind of protected bowl — a gorgeous place.

The Stefani Vineyard was first planted in 1889, but no old vines exist today. The Gallo family purchased the vineyard in 1988 and replanted in 1989 with an old field selection from Lodi, the Costa Magna selection, and vines are budded to various rootstocks. The vines are vertically trellised, and drip-irrigated.

Viticulture practices include meticulous shoot and leaf removal on the north side of east/west rows, and on the morning (east) side of north/south rows, for optimal sun exposure.

The rich, red-colored soil of the vineyard, a combination of Pleasanton and Clough series, consists of as much as 30% gravel and small stones. This provides for better drainage than the Chiotti Vineyard. The combination of soil and microclimates produces Zinfandel grapes filled with intense cassis and blackberry flavors and an almost earthy character that is accented with a full range of spices.

Grapes are hand-picked at an average of 24.5°. After destemming, they are usually fermented in upright fermentors along with a small percentage of Petite Sirah.

During fermentation, Cinnamon uses "rack and return," or punch-down, to obtain a more muscular Zinfandel. Stefani wine remains on the skins longer than the Chiotti, in order to get more extraction, heft, and body. When the wine is nearly dry, it is drained and pressed to tank, where it reaches dryness.

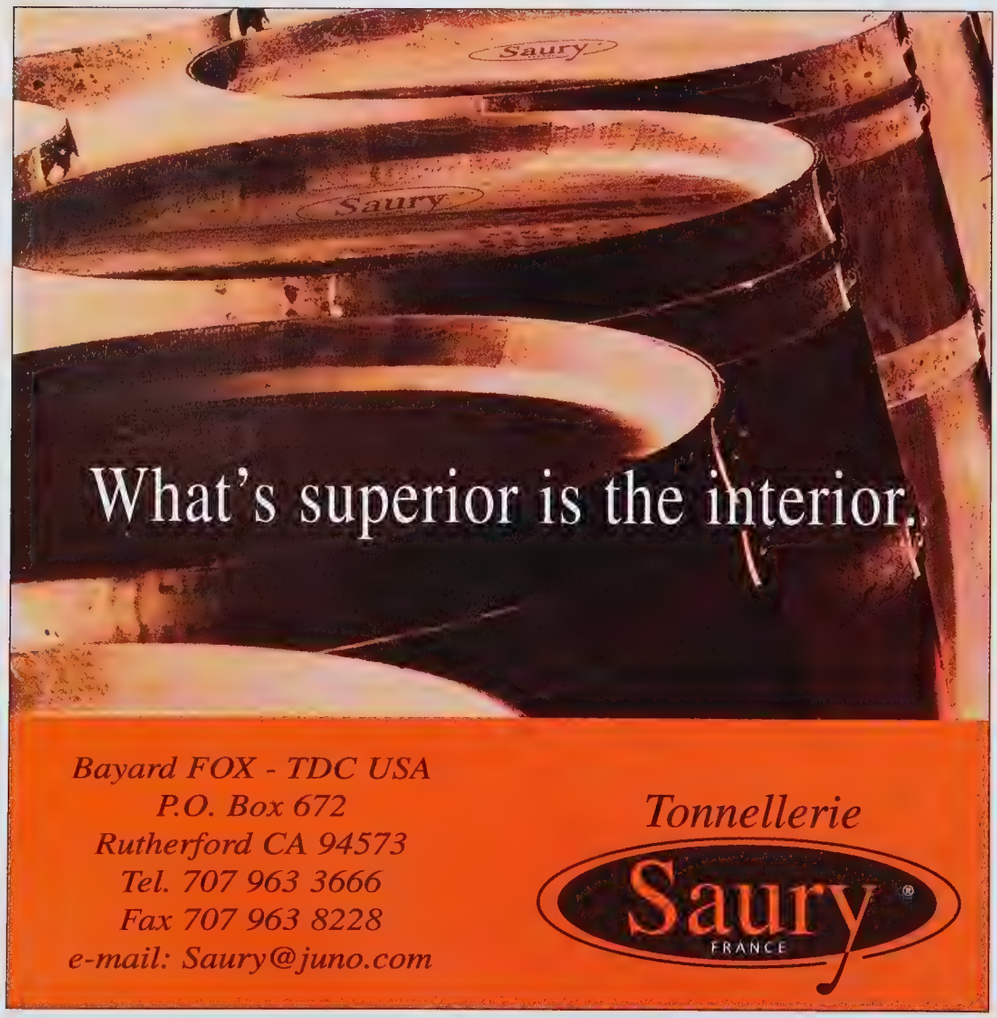
From this stage on, the Stefani Vineyard Zinfandel follows a similar regimen to the Chiotti. It is put into French and American oak barrels for about 12 months which can be entirely one-year-old or up to 25% new barrels, depending on the vintage. It completes malolactic in barrels to get more integration of flavors. The Stefani Zinfandel is bottled unfined and with only minimal filtration.

Conclusion

Besides the five Zinfandels, Rancho Zabaco also produces two fragrant, showy, whites wines: Pinot Gris and Sauvignon Blanc; a Sonoma County Syrah; and a Cabernet Port.

Rancho Zabaco Winery was established in 1996. Its first Zinfandel was a Dry Creek Valley. Encouraged by the success of this wine, and inspired by Joe Gallo's passion for Zinfandel, the family developed the current range of Rancho Zabaco Zinfandel wines soon after.

Rancho Zabaco wines enable the Gallo family to respond to a growing demand among young, more adventuresome wine drinkers for showy wines with intense fruit and texture — all in keeping with the Gallo family's tradition of good value wines. ■



Labels redesigned to boost brand awareness

BY Carol Caldwell-Ewart

"Expectations of gatekeepers [distributors and retailers] and consumers have gotten much higher in the last five years," asserts Mark Fedorchak, vice president and director of sales and marketing for Round Hill Vineyards & Cellars, St. Helena, CA. "They expect high quality in the wine and dynamic packaging, and they let us all know when packaging is tired."

Three California wineries, Round Hill Vineyards & Cellars, Canyon Road Winery (Geyserville), and Montevina Winery (Plymouth) all introduced redesigned labels in 2002. Each had a variety of reasons to do so, but at the root, they are striving to meet this edict from consumers and the trade described by Fedorchak: "People in the industry are investing a great deal more in marketing and packaging. Quality wine suppliers must provide innovative, now packaging that is on target with their brand."

Round Hill Vineyards & Cellars

"With new ownership, it was time to freshen our face," Theo Zaninovich explains Round Hill's package redesign. She and her husband Marko bought the winery in May 2000 after being stockholders for many years. They also own and operate ASV Wineries with facilities in Delano, CA, and San Martin, CA, and table grape vineyards in California and Chile.

Round Hill's new brand manager, Sandy Flanders, adds, "Sales people and distributors told us our previous label wasn't effective. It didn't reflect the high quality wine in the bottle, and consumers were misunderstanding the brand."

Once the new owners took over, Round Hill began "re-strategizing the brand," notes Flanders.

The new strategy includes not only an entirely new package, which has necessitated a significant investment in new equipment and change parts, but also an enhanced wine style, and improved print materials and point of sale information.

"Round Hill hasn't employed a concerted marketing effort in recent years," explains Flanders; "it's been doing well on its own. This new strategy is in response to a more competitive market and takes the brand to the next step in consumer image."

Round Hill produces four varietals, including Merlot, Cabernet Sauvignon, Chardonnay, and White Zinfandel, and a total of 250,000 cases annually. The new label promises that grapes are sourced "from California's finest growing regions."

"The wines are substantially improved," says Fedorchak. "With more tightly defined fruit sourcing, we have over-delivered. These wines are a very solid value at their price point [$8.99 suggested retail]."

In the package redesign, every aspect of the package was evaluated, says Fedorchak. "We were not bound to keep anything, and in the end, every element was changed."

The redesign was handled by Tony Auston of Auston Design Group, Napa, CA. Colotype (Napa, CA) prints the labels; bottles are from Caliber Glass (Benicia, CA); corks are from Scott Labs (Petaluma, CA); and poly-lam capsules from Pechiney (Napa, CA).

To implement the new package, the winery purchased a new Kosme Extra Fix labeler capable of applying wet-glue and pressure-sensitive labels at more than 100 bottles per minute for about $200,000, plus the necessary support equipment, such as conveyor belts and accumulator tables.

"The package needed to convey quality and make consumers comfortable with their purchase decision," explains Fedorchak. "We wanted to create something that clearly communicates our California position, something distinct and unique to the Round

Round Hill's new brand strategy includes a complete package redesign and an enhanced wine style.

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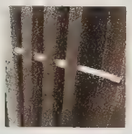

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Hill brand. We intended to convey that what's in the bottle will meet consumers' quality expectation."

Zaninovich adds, "We wanted something that celebrates California without clichés, that celebrates the earth and natural colors with richness and a slight touch of elegance. We tried to achieve something that was not slick, not corporate, because we are, after all, a family business."

The new two-piece, pressure-sensitive label features an original impressionist art work showing the California countryside. The paper has the look and feel of parchment. It is highlighted with a touch of gold foil.

The main label is the same on all four varietals, while a narrow band beneath it states the varietal, vintage, and California viticultural area. The only color change is the varietal name; reds are in burgundy and whites are in black.

The new package debuted on all Round Hill Wines on May 1, 2002.

Everything about the new package is "spot-on strategy," asserts Fedorchak, and the initial response has been "overwhelmingly positive."

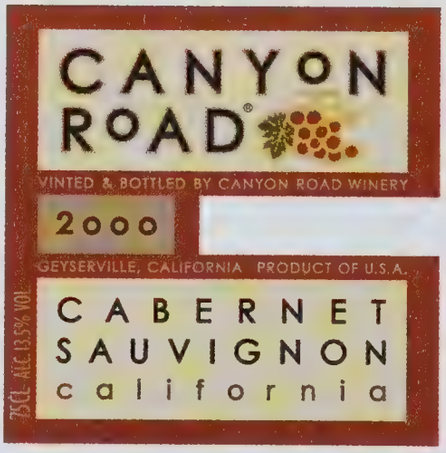
Canyon Road Winery

"The impetus for changing the Canyon Road label," says Peak Wines International Brand Manager Dave Trebilcock, "was feedback from the field that the old label was too recessive and didn't stand out on the shelf. The new look is an opportunity to reintroduce Canyon Road to consumers and distributors."

Canyon Road Winery, owned by Jim Beam Brands Co. (JBBCo) and marketed by Peak Wines International, a part of JBBCo, produces six varietals annually for a total of about 300,000 cases. The winery's California-labeled Chardonnay, Merlot, Shiraz, Cabernet Sauvignon, Sauvignon Blanc, and Zinfandel all sell for $7 to $9 — the same price point they sold for before the redesign.

"The brand needed some new energy, and the label repositions the brand by speaking better to consumers we want to reach: the younger urban/suburban who identifies with working hard, coming home, and connecting with family and friends," Trebilcock explains. "It reflects the California lifestyle with bold, rich earth-tone colors."

Press releases characterize the new label, which is die-cut into a letter "C," as reflecting "the Arts and Crafts heritage of the winery's early California roots." Its simple design is highlighted with gold leaf and light embossing, and each varietal label is in a different color.



Canyon Road's new label (L) is a significant departure from the old label (below).

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The label was designed by Nicole Lembi of Michael Osborn Designs in San Francisco. "We asked her to take a look at this label from a female perspective," adds Trebilcock. The company was looking for a label that women would identify with when they walk into a store.

Estate Wine Label Co., Napa, CA, prints the wet-glue label. The new package uses the former package's bottle shapes. More than $20,000 were spent on change parts to enable the labeler to handle the new label. No changes were made in wine style. "With their approachable, balanced style, our wines speak to our target market already."

Though the original need was to improve the label from a retail perspective, it was crucial that the new label "was equally appropriate for the restaurant environment." Trebilcock believes the new label's "memorable shape and look and feel play well to both channels."

Apparently consumers and distributors feel the same. Canyon Road's new label was first released on its Sauvignon Blanc in November 2001, and as of May 2002, all the new labels had been released.

"Year-to-date shipments are up 50% over 2001," reports Trebilcock. "We have received a great response from distributors and retail clients. The energy is back in the brand again. People are excited about Canyon Road."

Montevina's new look (L) replaces a once trendy clear label (R).

Montevina Winery

"Labels are like fashion," says Lesley Larson, marketing director for Montevina Winery in the Sierra foothills of Amador County when explaining Montevina's label redesign; "things look a little dated after awhile, and it's time for a spruce up."

In addition, Montevina completed construction of a new, 64,000-square-foot facility in 2000. "We had been in the old label style for some time [five years], and in the meantime, had built a larger winery in Plymouth. The old label/package and the new winery didn't jibe."

Owned by the Trinchero family, owners of Sutter Home Winery in St. Helena, CA, Montevina produces about 100,000 cases of wine each year and has 400 acres of sustainably farmed estate vines, in production since the mid-1950s. Amador County Zinfandel and Barbera are the featured varietals; the winery also produces California Pinot Grigio and Sauvignon Blanc, plus Amador County Sangiovese and White Zinfandel. The wines sell for about $10 retail.

Montevina's previous package featured a once-trendy, clear pressure-sensitive label. The new label, also pressure-sensitive, is in a more traditional style, with textured paper, screens, and embossing. It was designed within the constraints of Montevina's production equipment to avoid costly parts changes.

"There have been many changes in pressure-sensitive labels since our last label. With the advances, we were able to do more, while still maintaining the same equipment," explains Larson.

The new label features original art of the new winery building and surrounding vineyards, and colors in the illustration were subtly changed to coordinate with each varietal.

Montevina's distinctive horizontal-striped capsules (retained from the old package) are also color-coordinated with each varietal. Labels have a black background for the reds, and a white one for the whites. Bottles remain the same, and the wine style has not changed.

Montevina is supporting the new package with new shipper graphics, brochures, and in-store collateral. HKA in San Francisco designed the new package, and fp Label in Napa prints the labels.

The new package shipped first in February 2002 on the 2001 Pinot Grigio. Labels for other varietals are changing as the vintage changes, and all will be out by the end of 2002. Larson reports that there has not been enough time to measure the sales impact of the new package.

"We're trying to reach people who are ready to move on from Merlot or Chardonnay," says Larson. "With the label redesign, I want to express what's in the bottle. In addition, since not everyone can make it to Amador County, we try [with the label] to bring a little bit of Amador to them. I look at the label as an extension of what's in the bottles." ■

Bonny Doon does "The Right Thing"

BY Carol Caldwell-Ewart

Bonny Doon released 80,000 cases of its of Ca' del Solo Big House White and Big House Red with Stelvin™ screwcap closures in July 2002. That's nearly half of Bonny Doon's 200,000-case annual production in Santa Cruz, CA, and a bigger move than any other U.S. winery has yet made toward using a screwcap closure.

From the Bonny Doon website, winery owner Randall Grahm declares: "It may be argued that this is a gutsy move on our part in light of the aversion of *the entire rest of the industry* to stick their well-fed necks out and to do what is unquestionably The Right Thing *vis-à-vis* wine conservation."

Grahm and John Locke, Bonny Doon director of public relations, assert their belief that, if consumers accept their premium wine with a screwcap closure, other wineries will be quick to follow their lead.

On a necker affixed to the new bottles, Bonny Doon makes its case to consumers for allowing screwcaps to move into the premium wine category.

> "Rest assured that the Stelvin™ is in no way an inferior form of closure to the more prevalent 17th century technology, commonly referred to as the 'cork.' While the Stelvin™ closure may not provide the cork's POP and circumstance we associate with this potent cultural signifier, there are a few other tree-bark related shortcomings that it elegantly eludes. Specifically, wines sealed with a Stelvin™ closure are not susceptible to "corkiness," that noxious mustiness that all too often taints wines sealed with even the most expensive traditional corks.
>
> "In addition, extensive research reveals that the Stelvin™ closure makes a nearly perfect airtight

seal, actually more airtight than a cork. This means your bottle of Big House will age ("conserve" the wine mavens would sniff) more slowly and elegantly than if it were sealed with a conventional cork.

"There is also the significant matter of convenience. One needn't possess a post-graduate degree in mechanical engineering nor possess superhuman strength and dexterity (or even a corkscrew, for that matter) to open the Stelvin™ closure. Opposable thumbs will do.

"Finally, should you fear for your reputation among the wine drinking cognoscenti, you may well find that by purchasing this bottle, you have elevated yourself to the very highest echelon of social grace. Who else possessed the wit and foresight to appear at an impromptu Sunday afternoon picnic in the park to delight their companions with but the tiniest turn of the screw?"

In a press release announcing the move to screwcaps, Grahm told the wine press: "I am literally betting the farm on this somewhat retro but absolutely cunningly brilliant technology." He quoted Vincent Rabanas, general manager for Pechiney Cork & Seal of California, the French manufacturer of the screwcap: "This is definitively the biggest commitment on the part of a U.S. winery to the Stelvin screwcap."

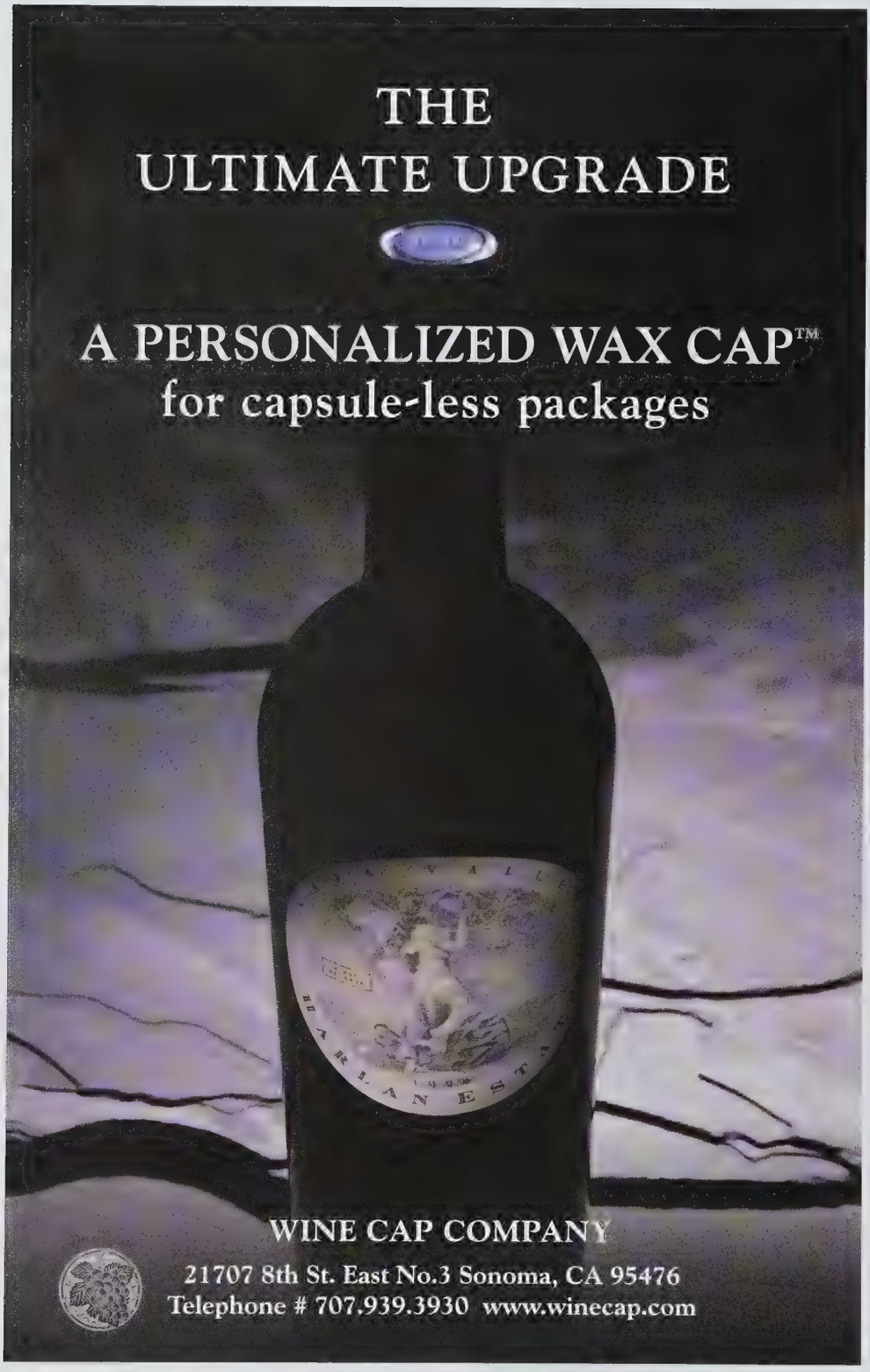
Locke suggests, "These 80,000 cases of Big House Red and White [$10 retail] will be a very interesting test case. If the winery is still standing at the conclusion of the experiment, I think you can expect to see many more of our products migrating to screwcaps over the next several years."

The winery is not making any real winemaking changes to accommodate screwcaps. Locke says, "The membrane under the closure, which seals against the bottle, is completely inert and forms a very airtight seal. We, therefore, are not worried about needing more SO_2 at bottling. We are confident ... that the wine will age slowly and gracefully in screwcaps."

Switching to the screwcap required a Bonny Doon investment of more than $100,000 for the new equipment necessary on the bottling line (manufactured by MBF of Italy) and for conveyors and other engineering.

Manufactured and imported by Saverglass, Inc., (Napa, CA), the new bottle is a tall straight-sided Bordeaux classic in clear and antique green originally designed for the Australian market, where screwcaps have gained more acceptance.

Ultimately, Locke and Grahm agree, the change was made to assure wine quality. "We believe screwcaps are the best available solution," Locke says. By 2004, he expects buyers will recognize Big House Red as a trend setter "one of the first wines in a screwcap," adding, "The future is now." ■



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Fermentation advice for making dry wine from late harvest fruit

BY Linda F. Bisson
Department of Viticulture & Enology
University of California, Davis

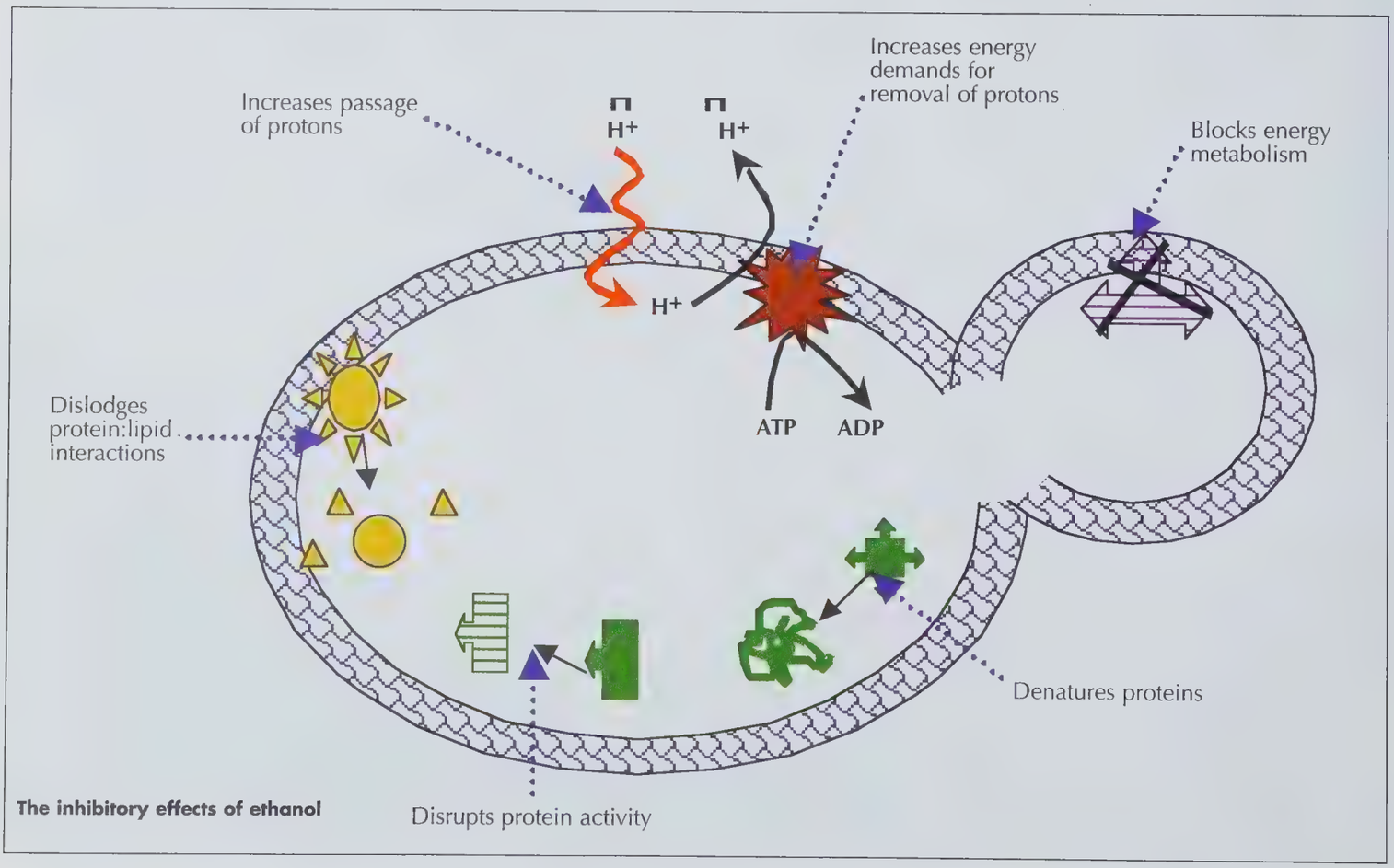
There are many operational definitions of "late harvest." The term can refer to fruit from an unusually long growing season that is of moderate Brix value (less than 23°). It can refer to fruit at or above a target Brix level (generally 26° Brix). Or, it can refer to fruit from vineyards harvested later than others by an individual winery.

Late harvest may also have stylistic connotations, referring to classes of wines that are high in residual sugar. For the purposes of this article, late harvest will be defined in the context of production of dry table wines by the sugar concentration of the fruit, as sugar concentration dictates ethanol yield, and ethanol yield significantly impacts yeast behavior during fermentation. The goal here is to describe fermentation management strategies that can increase the likelihood of high Brix juices or musts attaining dryness.

Most yeast strains are readily tolerant of ethanol concentrations up to 14%. Sugar-to-ethanol conversion ratios in California vary from 0.55 to 0.61, depending upon the varietal, growing region, production, and fermentation practices.[1] Using this range, juices or musts at sugar levels between 23° and 25° Brix could yield 14% (w/v) alcohol or more (Table I).

Fermentations that reach or exceed 14% ethanol will be stressful to yeast, regardless of the maximum ethanol concentration to which the strain is tolerant.[2] From the yeast's perspective, life would be a lot easier if winemakers never ripened grapes above 24° Brix. There are several fermentation management strategies that can optimize the ethanol tolerance of the yeast and minimize chances of a problematic fermentation.

Depending upon the varietal, climatic conditions, and the growing region, grapes may not reach an optimal flavor and aroma profile until a high sugar content is attained. Sugar and flavors do not always increase at the same rate



The inhibitory effects of ethanol

during fruit development, so the Brix at harvest for fruit of optimal varietal characteristics may vary as well from season to season and among vineyards within the same region.

Three important issues affecting yeast metabolic behavior emerge as grapes remain on the vine post-veraison. The first issue concerns compositional changes in the fruit that then impact fermentation performance. The second relates to differences in the microbial flora that also affect metabolic activities of the yeast. The important third consideration is the influence of elevated ethanol levels on fermentation progression.

Changes in fruit composition

During extended ripening, two types of compositional changes occur in the fruit: those impacting the chemical content and those affecting the presence and level of grape enzymatic activities. Grapes continue to metabolize as they remain on the vine, and specific changes in enzymatic activity also occur.

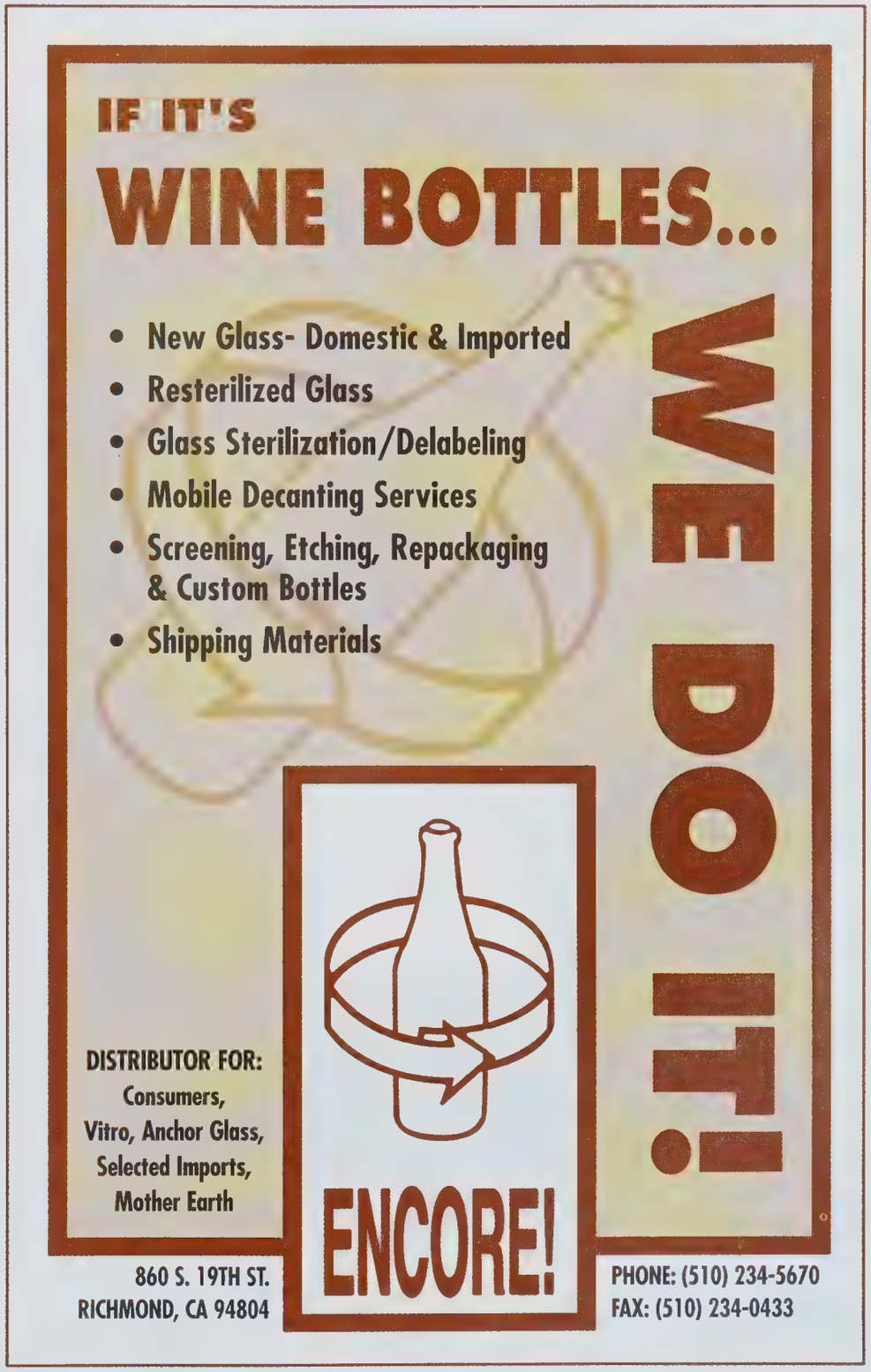
Variation in acidity and pH primarily impact yeast behavior. Malate is utilized as an energy substrate by the fruit. Malate levels in the fruit decline later in the growing season. At the same time, the pH value increases. Late harvested fruit may therefore be higher in pH and lower in malate than fruit harvested earlier in the season.

Low malate and high pH will determine which microbes can persist in the fermenting juice or must and affect their growth and metabolic rates. Many bacteria are inhibited at pH values below 3.3, and there are several genera that can persist at pH levels above 3.8.[1] The higher the pH, the greater the number and diversity of bacterial species that can be found, alive and metabolically active.

The pH level also affects the concentration of the microbiologically inhibitory molecular form of SO_2. The amount of SO_2 required for an inhibitory level of 0.825 mg/L molecular SO_2 is 23.1 mg/L at pH 3.2, but nearly five-fold higher (112 mg/L) to achieve the same level of molecular

Table I. Predicted ethanol yields from initial Brix values.

	Predicted ethanol %w/v conversion factor:	
Brix Value	0.55	0.61
19	10.5	11.6
20	11	12.2
21	11.6	12.8
22	12.1	13.4
23	12.7	14.0
24	13.2	14.6
25	13.8	15.3
26	14.3	15.8
27	14.9	16.5
28	15.4	17.1



SO_2 at pH 3.9.[1] Depending upon the intended purpose of the SO_2 addition, the level of total SO_2 added may need to be adjusted for the pH.

Changes in the biochemical activities of the grape also occur that can have an effect on yeast behavior. The enzyme polyphenoloxidase (PPO) is responsible for enzymatic browning in wines, and it competes with yeast for molecular oxygen in the must or juice. Polyphenoloxidase levels vary during fruit ripening. Levels are initially low in fruit pre-veraison, increasing around the time of initiation of grape maturation.[3]

PPO activity declines immediately post-veraison, and then increases again to an even higher level. A second drop in PPO activity is found somewhere between 16° and 23° Brix.[3,4]

The juice of grapes harvested at 24° Brix should have a lower PPO activity than would occur at earlier harvest. The decrease in PPO activity would favor yeast use of the available oxygen. However, PPO activity varies by cultivar, and "lower level" is a term relative to the starting maximum of activity. Non-enzymatic oxidation reactions would also be expected to occur more readily if competition with biochemical oxidation is reduced, thereby reducing O_2 available to the yeast.

Softening may impact must composition indirectly by affecting the timing of extraction of skin and pulp components. Softer fruit tends to lead to a higher density of microbes on the surface of the fruit due to exudates occurring around the pedicel of the berry. Also in reds, the more "pulpiness" of earlier picked fruit may increase the initial active concentration of SO_2 in the must (when SO_2 is added at crushing) because the liquid volume in which it dissolves is smaller than anticipated.

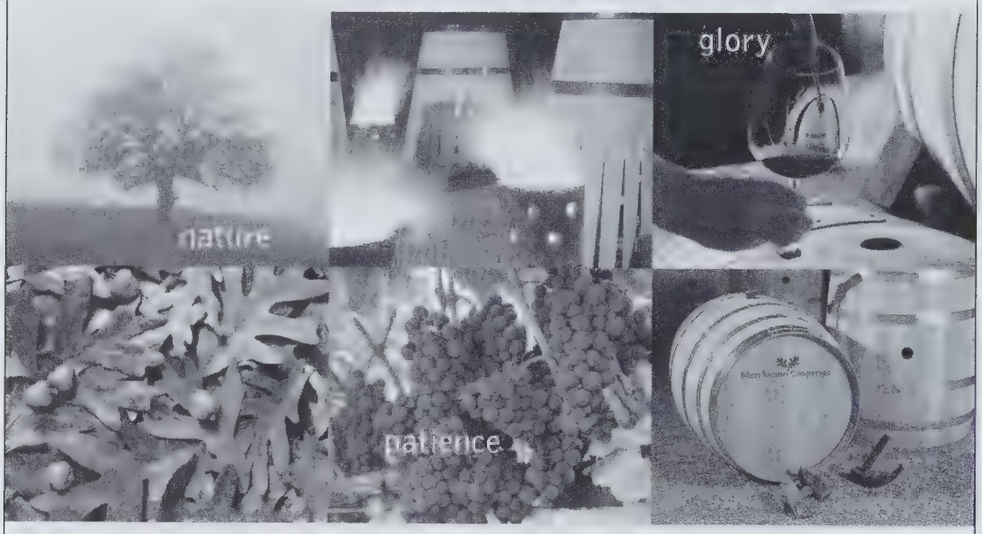
Polysaccharide composition may also differ in high Brix grapes, as softening and raisining occur. Although these changes may impact wine processing, they have little effect on the metabolic behavior of the yeast.

In some varietals, late harvested fruit is prone to producing juice and must of high viscosity. This can impact settling, dissolved solid content, and heat transfer properties of the fermenting medium. In these cases, fermentation temperature may rise to inhibitory levels for continued yeast metabolism, and may impact yeast viability.

Changes in the microbial flora

Although research has been limited, there is evidence that the flora of the surface of the grape berry changes with extended time on the vine. In tropical fruits with a similar yeast flora to grapes, as the fruit remains on the tree non-apiculate yeasts, members of the genera *Candida*, *Pichia* and *Issatchenkia*, become more dominant.[5,6] These yeasts emerge because a wider spectrum of carbon and energy sources, including organic and amino

a wine story



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acids, is present on the fruit's surface due to release or seepage from the fruit.

We have found similar species in grape fermentations of Chardonnay harvested at 26° Brix.[7] These species were found to persist in the fermentations, and had not been previously reported in native flora fermentations at lower Brix.

The concentration of *Saccharomyces* also increases with increasing maturity of the fruit.[8,9] In general, yeast levels, including the apiculate yeasts, increase during extended ripening.[10] This suggests that a much more diverse wild yeast flora will be present on late harvest fruit.

Fungal and bacterial populations are also known to fluctuate on grape surfaces, but the factors involved are complex, and dependent upon humidity, disease pressure, insect vectors, and use of fungicides.[11,12,13] Fungal attack on the fruit releases nutrients, which generally favor the growth of the bacteria.[12]

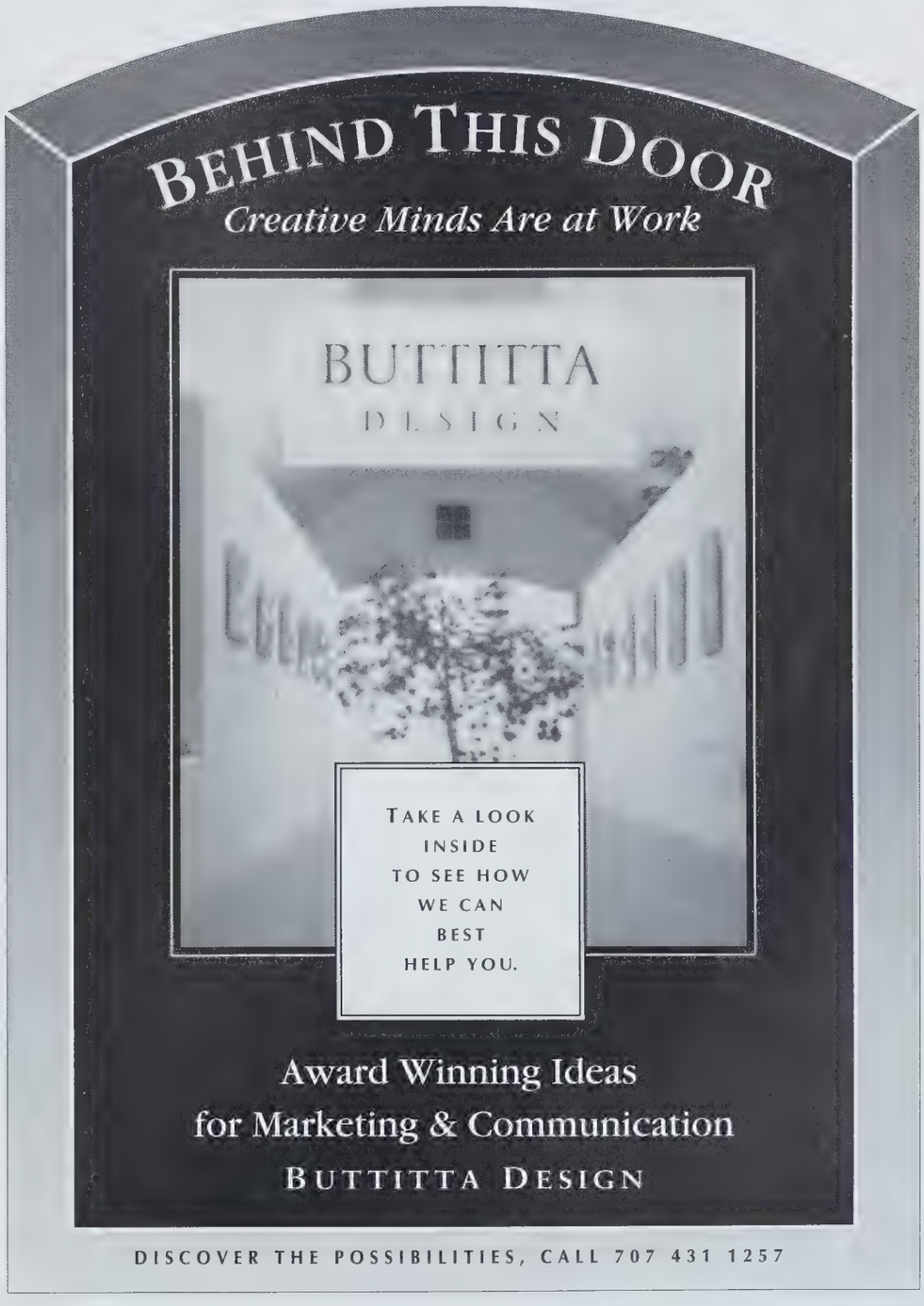
Acetic acid bacteria populations increase with greater maturity of the fruit, with even more dramatic increases in number if there is any damage to the fruit.[13] Lactic acid bacteria also vary (in both numbers and species) with grape maturity level.[14] R. R. Davenport reported an increase in spoilage yeasts on very ripe grapes.[11]

The main conclusions of studies on changes in berry microflora during extended ripening are consistent: there is an increase in the levels and numbers of yeast species relative to molds, an increase in non-apiculate yeast species, including *Saccharomyces*, and changes in the number and species of bacteria. Late harvested juices and musts will therefore have a more varied microflora, with higher numbers of organisms that can compete with *Saccharomyces*.

The effect of these changes on *Saccharomyces* will be variable, depending upon the nutritional content of the must or juice and inoculation practices. The temperature of the fruit at harvest and during processing will impact growth rates of the bacteria and yeast. In general, at warmer temperatures (30°C and above), the bacteria will grow more rapidly than the yeast. Lower temperatures may favor the yeast.

If the must or juice is too warm, it may be necessary to consider a rapid reduction in temperature using a heat exchanger. A healthy yeast inoculum will allow *Saccharomyces* to dominate the must regardless of the initial bioload of other microorganisms.

Managing the microflora of these fermentations can be challenging to the winemaker, especially if spoilage organisms are present. Sulfur dioxide may be used to inhibit the wild species, but this might not be completely effective, depending upon the pH of the juice or must. On the other hand, the sensory contributions of these organisms may be desired, precluding addition of SO_2.



Temperature should also be monitored and perhaps controlled as this will affect the relative bioload of the species present.

Impact of higher ethanol levels

Higher initial Brix or sugar levels obviously mean that the fermentation will attain higher alcohol levels at dryness. *Saccharomyces* strains are typically tolerant to ethanol levels of 11% to 12%, with the majority of commercial isolates tolerant to 14% ethanol. Strains with higher tolerances, to 17% or greater, exist and are commercially available.

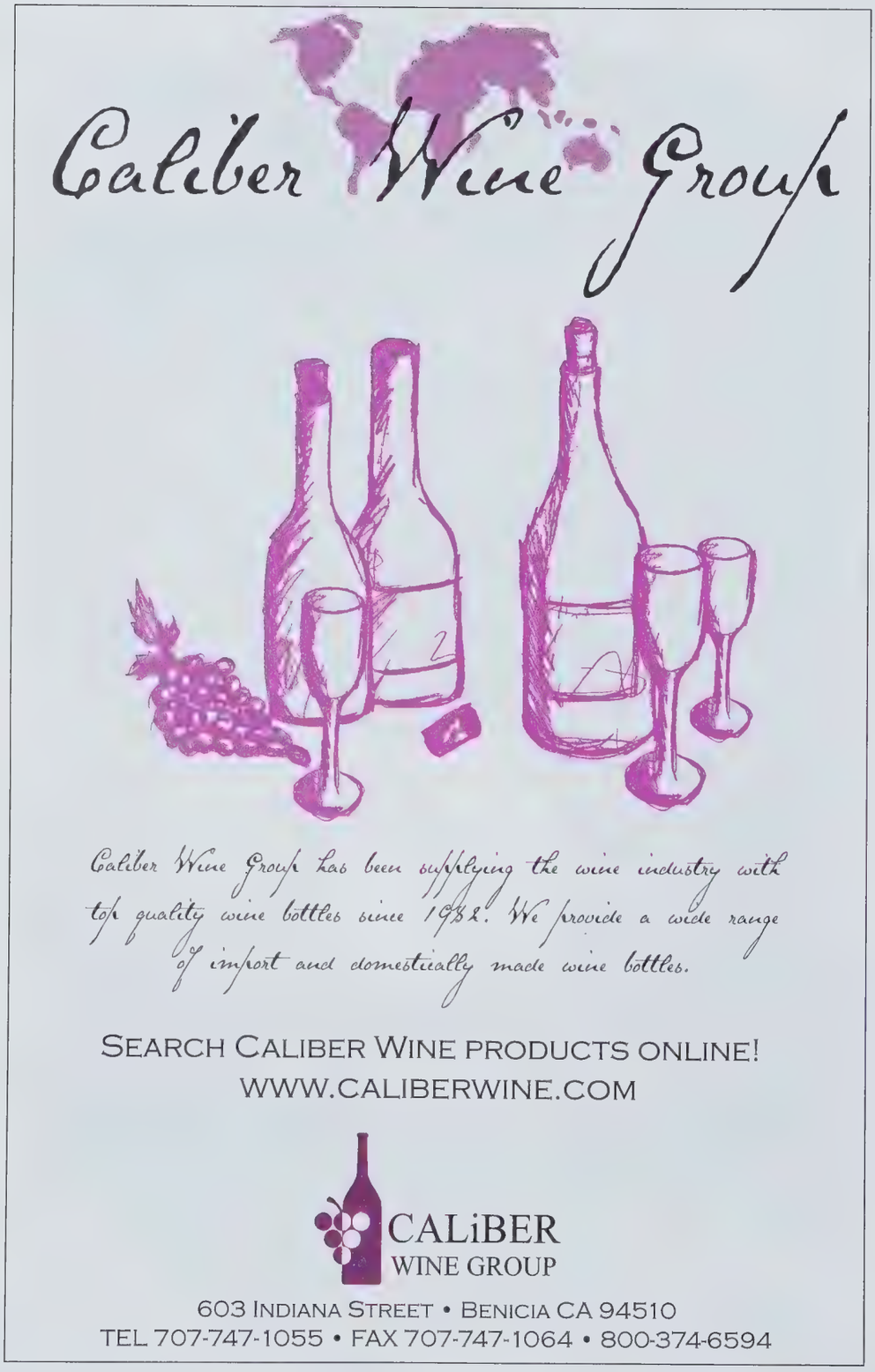

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Figure I (page 50) presents a comparison of the fermentation profiles of Muscat of Alexandria at two different maturity levels (19.6° and 26° Brix), which yielded wines with ethanol contents of 11.9% and 15.6% w/v, respectively. The same commercial strain was used to ferment both juices, and they received no nutrient additions. Fermentation was conducted at 16°C. Both juices had sufficient nitrogen for the completion of fermentation.

These data are typical of several similar comparisons that we have done with different red and white varieties. Once the lag phase has passed, fermentation rates are similar. Both curves display a distinct transition from faster to slower rates of metabolism.

In the case of the 19.6° Brix curve, this transition occurs around 1° Brix, while in the case of the 26° Brix juice, it occurs with approximately 6° Brix remaining in the fermentation. The 19.6° Brix wine was dry within 48 hours of this rate transition, while the 26° Brix sample required nine days to reach dryness, and became even more sluggish toward the end of fermentation.

The transition point in both juices occurred at an ethanol level of around 11% to 12%. The slightly higher ethanol level at the point of transition for the 26° Brix juice may reflect the fact that it had a much higher nitrogen content (by 50%) than the lower Brix juice.

Ethanol becomes inhibitory to yeast fermentation, and this and other data suggest this happens around 12% ethanol.[15] Attaining dryness in high Brix juices requires maintenance of ethanol tolerance of the yeast. There are several properties of yeast that are sensitive to ethanol inhibition (Fig. 2). The principle effects are due to changes in protein conformation and interaction with other components as ethanol displaces water of hydration on the surface of these molecules.

D. E. Block and co-workers have reported a relationship between completion of fermentation and relative concentrations of sugar and nitrogen.[16] The higher the sugar content, the higher the amount of nitrogen that is required to finish fermentation.

This relationship is not a simple linear one, suggesting that complex physiological factors are involved.

The nutritional content of high Brix juices in general may need to be higher than juices and musts of a lower sugar content.

Supplements that enhance fermentation rates under high ethanol conditions — sterols, proper fatty acids or aeration, and vitamins and minerals — should be considered, especially if the vineyard has a history of yielding fruit prone to sluggish or stuck fermentations.[15]

In addition, care must also be taken to be sure that factors or conditions that increase ethanol sensitivity do not occur. One example would be a dramatic change in temperature experienced by the yeast, an increase or decrease of five degrees within a couple of hours.[15]

High brix fermentations

Special management strategies are required for fermentations that are expected to attain a high ethanol content. Common problems reported with these fermentations are: increased levels of acetic acid, increased incidence of "bad lactics," and increased incidence of slow or incomplete alcoholic fermentations.

These problems are expected, given the changes in the microflora of the berry surface and elevation of pH levels favorable to potential spoilage organisms. If the additional yeast nutritional needs have not been met, fermentation arrest will result.

Several steps can be taken to ensure that a juice or must with a high initial Brix level will achieve dryness. First and foremost, a strain tolerant to the predicted ethanol level should be used.

It is risky to assume that wild *Saccharomyces* flora of the fruit will be resistant to ethanol levels greater than 14%. It is also important to use a strain that is tolerant of other microbes and not likely to be inhibited by metabolic activities of bacteria or of non-*Saccharomyces* yeasts.

Nutrient supplementation should be considered. Nitrogen levels should be monitored with the knowledge that a higher level may be required for higher Brix juices.

Given the higher bioloads of these juices and musts, the nutrient addition should be timed to provide the greatest benefit to *Saccharomyces*. If the must has been inoculated, this addition can be made 24 to 48 hours later. If the must has not been inoculated, the addition should occur immediately upon onset of fermentation as indicated by the first noticeable decrease in Brix level.

Aeration or mixing of the must or juice to stimulate ethanol tolerance should also be considered. This should be done prior to the transition to the slower rate of fermentation. Our work suggests it is most effective if it occurs right after *Saccharomyces* is established.[17]

It is also important to monitor temperature changes more closely in fermentations that will reach high ethanol

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levels. We have found that increases greater than 5°C that elevate temperature to 30°C or higher can lead to arrest of fermentation at 11% to 12% w/v ethanol, regardless of when the shift occurred during fermentation.[18]

Continued on page 75

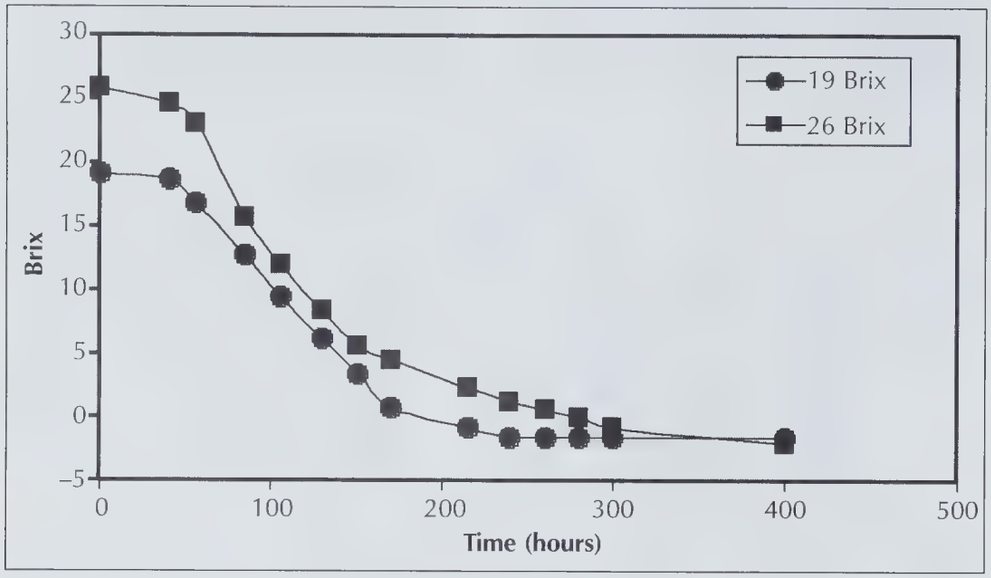

Figure 1, Fermentation of Muscat at two maturity levels.

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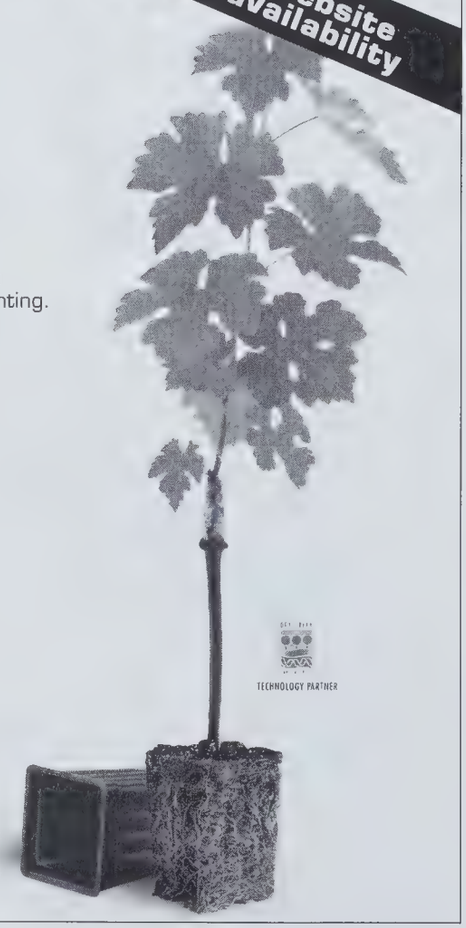


IN MEMORIAM

Wines & Vines publisher Hiaring will be missed

Philip E. Hiaring (57), editor and publisher of *Wines & Vines* magazine, died at home in Novato, CA, on June 2.

Wines & Vines was owned by Hiaring's father (also Philip), when Hiaring joined the magazine in 1973. He bought the publication from his father in 1989.

Hiaring was born in Idaho and moved to Marin County, CA, as a child. He graduated from San Jose State University in public relations and journalism in 1967 and worked as publicity officer for Crocker Bank in San Francisco and as a sports-writer for the *San Jose Mercury News* before joining *Wines & Vines*.

Wines & Vines President and CEO Dottie Kubota-Cordery was in negotiations to buy the magazine from Hiaring when he died. His sister, Anne Hiaring, reports that the sale of the magazine will proceed. At the time of his death, he had been planning his retirement life, fly-fishing on the Bitterroot River in Montana.

Kubota-Cordery, who had worked with Hiaring from early on, remembers, "In a sense, we grew up together with the magazine and the wine industry. Phil was always excited about what was happening in the industry, and he always called it as he saw it."

Wines & Vines Associate Editor Larry Walker recalls: "He was a man who was passionate about the wine industry, enjoyed his role in it immensely, and took real stands on the issues."

At *Practical Winery & Vineyard*, we must concur with Hiaring's sister who was quoted by a Sonoma County newspaper, "My brother was a character known for his wit, wisdom, and journalistic irreverence. He is going to be missed by many." ■

New shippers keep bottles snug

BY Carol Caldwell-Ewart

In April, Chalone Vineyard (Soledad, CA, Monterey County) began shipping its first Syrah snugly protected by case partitions that closely resemble egg cartons in design and composition. In May, this eco-friendly case partition, called a "shroud" won the winery an award for design distinction in a prestigious international packaging design competition.

All 43,000 cases of the winery's 2001 vintage estate-grown wines: Chenin Blanc, Pinot Blanc, Pinot Noir, and Chardonnay, will be shipped with the innovative partitions this year, but that's only the beginning. Management at Chalone Wine Group (Napa, CA), owner of Chalone Vineyard and a dozen other wineries in California, Washington, and France, hopes that eventually the shroud will protect all of the company's wine.

Manufactured by Regale Corporation (Napa, CA) of 100% recycled paper, the shroud is molded in two parts. One piece closely follows the contours of the top of each bottle and holds the bottles firmly, just like the pockets in an egg carton cradle a dozen eggs, so they can't bump or rub against each other. A bottom piece keeps the bottles aligned and separate.

Chalone Wine Group's recycled office paper becomes part of the mix of post-consumer cardboard, newsprint, and office paper that is pulped together to form the partitions. Twenty-two pounds of waste paper become partitions for 66 wine cases.

In the past, tooling costs and high volume requirements have put molded fiber packaging beyond the reach of small industries like the wine industry. Regale has developed (and is patenting) tooling and manufacturing processes that cut tooling costs by 90% and reduce the heat required to dry and finish the partitions by 40%. The result is a product that is affordable for wineries.

Chalone reports that the shroud saves labor on the bottling line because no one has to prepare the partition, it's ready to go. It is also somewhat lighter in weight than other partitions. The biggest advantage is that nothing touches the labels, so there's no danger of scuffing.

Currently, Chalone buys its glass in bulk and is hand-loading cases at the winery, but if the wine industry creates enough demand for the shroud, glass companies may begin to pack bottles in them for delivery to wineries for bottling. ■

FOCUS ON WINE STYLE

MANAGING DIACETYL LEVELS DURING MALOLACTIC FERMENTATION AND BEYOND

BY Eric Johannsen

When one considers the typical attributes of wines that have undergone malolactic (ML) fermentation, reduced acidity and buttery aroma first to come to mind. In fact, we come to expect these characteristics in wines, such as Chardonnay, that has completed 100% ML fermentation.[1]

It is widely known that the conversion of malic acid to lactic acid leads to a reduction in acidity and a rise in pH. From where, then, does the buttery aroma associated with ML fermentation arise?

Most of us are aware that the major compound involved in the butter or butterscotch aroma in wine is diacetyl. When pressed to explain its source, though, many would describe diacetyl production as an inevitable consequence of ML fermentation (whether desired or not). It turns out that this is **not** necessarily the case: in examining the metabolism of lactic acid bacteria, greater control over diacetyl production is more readily attainable than one would expect.

Studies on diacetyl production and ML bacteria have shown that the timing of sulfur dioxide (SO_2) additions and the degree of oxygen exposure to wines can profoundly affect final diacetyl levels in the wine.

In an attempt to conceptualize the processes involved in ML fermentation, many people implicitly construct a simple representation of ML fermentation as:

malate $\xrightarrow{\text{ML bacteria}}$ lactate + diacetyl

However, when we take a closer look at malolactic fermentation, this relationship overlooks some important details. By investigating the nuances of the metabolism of lactic acid bacteria, one discovers potential strategies for modifying wine flavor.[2]

Malate conversion

The most important aspect of ML fermentation concerning wine production is that 99+% of the malate metabolized by *Oenococcus oeni* is enzymatically converted to lactate by malate decarboxy lyase. The primary significance of this conversion in winemaking is that the degradation of malate to lactate results in the deacidification of wines. Malic acid having two carboxyl groups is decarboxylated to lactic acid with only one carboxyl group. This reaction translates to a rise in pH and a decrease in acid-

Electron microscope images of lactic acid bacteria: *Lactobacillus brevis* (L) and *Oenococcus oeni* (R). Images provided by Jeff Broadbent and Utah State University EM facility. Organisms were colorized to enhance contrast.

ity, which results in a decreased general perception of tartness in wine.

Diacetyl formation

Surprisingly enough, diacetyl is not involved in the enzymatic conversion of malate to lactate. It is generated via a separate pathway altogether. Diacetyl (2,3-butanedione) arises from a side reaction of the glycolytic pathway of lactic acid bacteria and, to a limited extent, wine yeast.

Production and degradation of diacetyl by *Saccharomyces cerevisiae* in beer is an integral part of the brewing process. *S. cerevisiae* has also been shown to produce and subsequently consume diacetyl in wine, leaving low residual levels.[4]

More attention has been focused on diacetyl production by lactic acid bacteria as a consequence of its greater capacity to increase diacetyl concentrations. The particular pathway by which lactic acid bacteria generate diacetyl has been

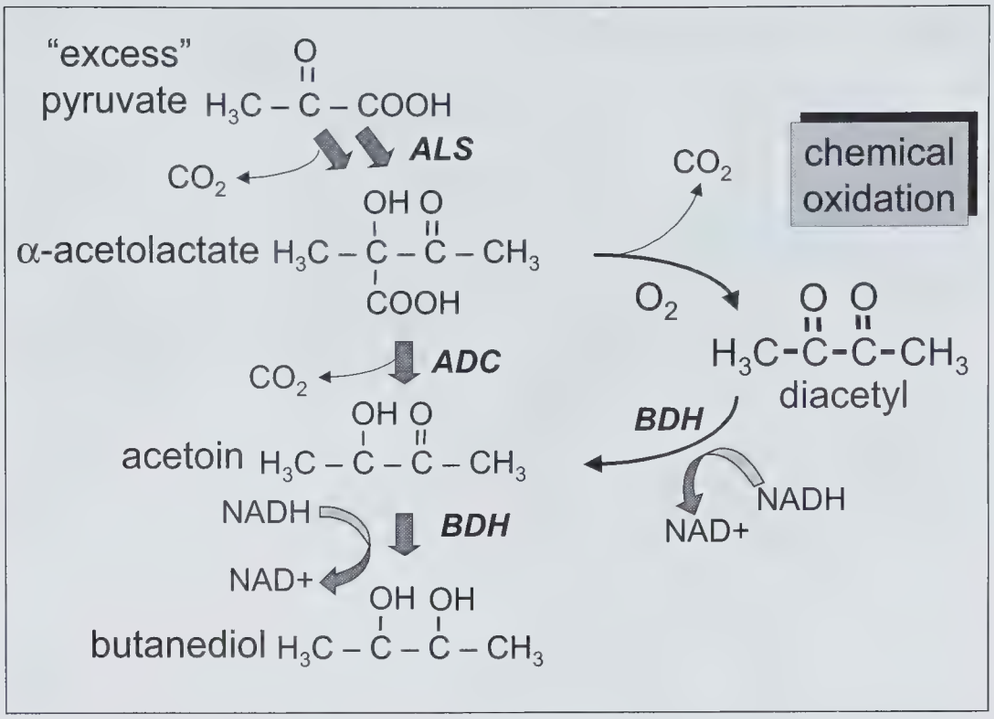
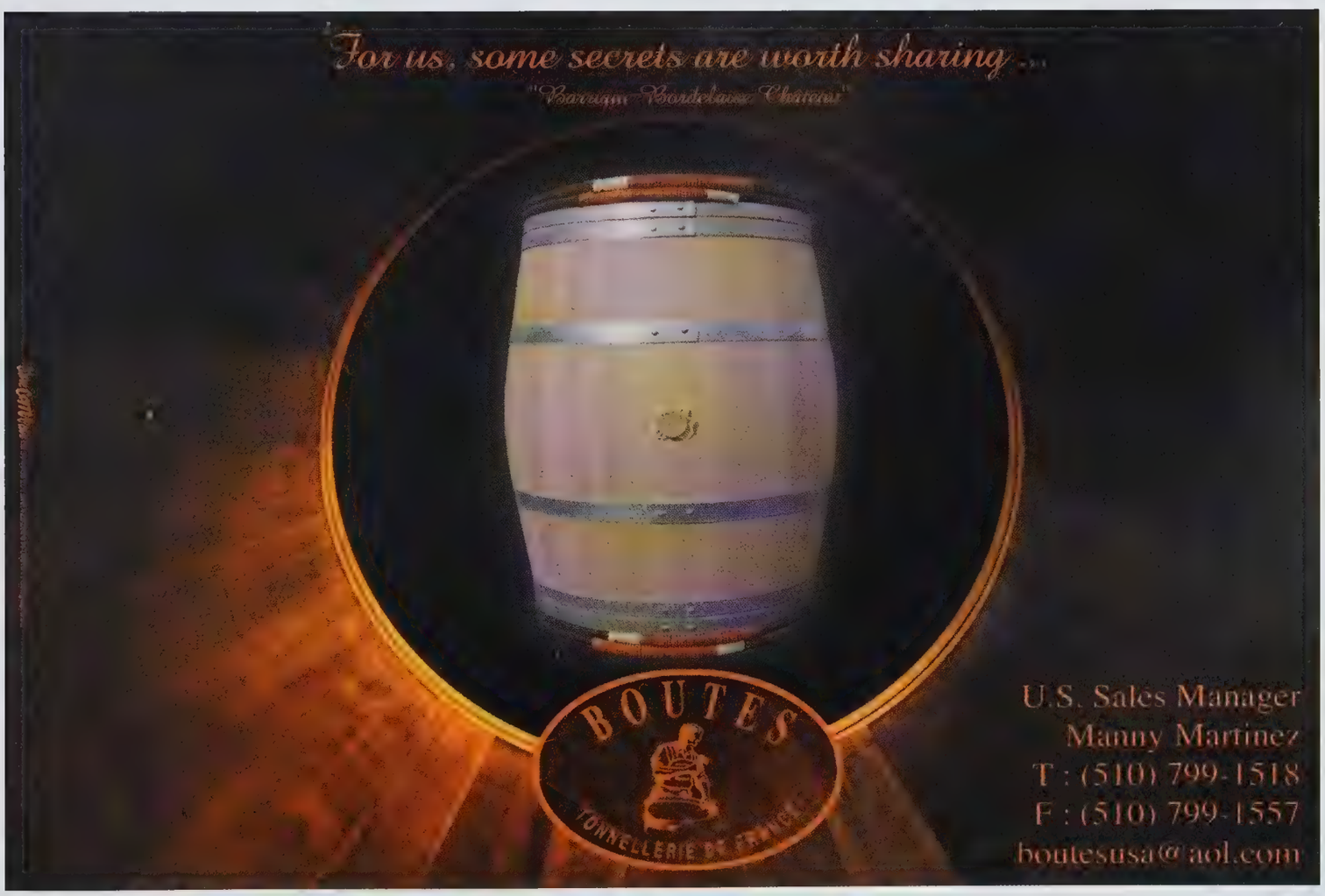


Figure 1 — Diacetyl formation and degradation pathway
Courtesy of Dr. David A. Mills, Dept. of Viticulture and Enology, University of California, Davis



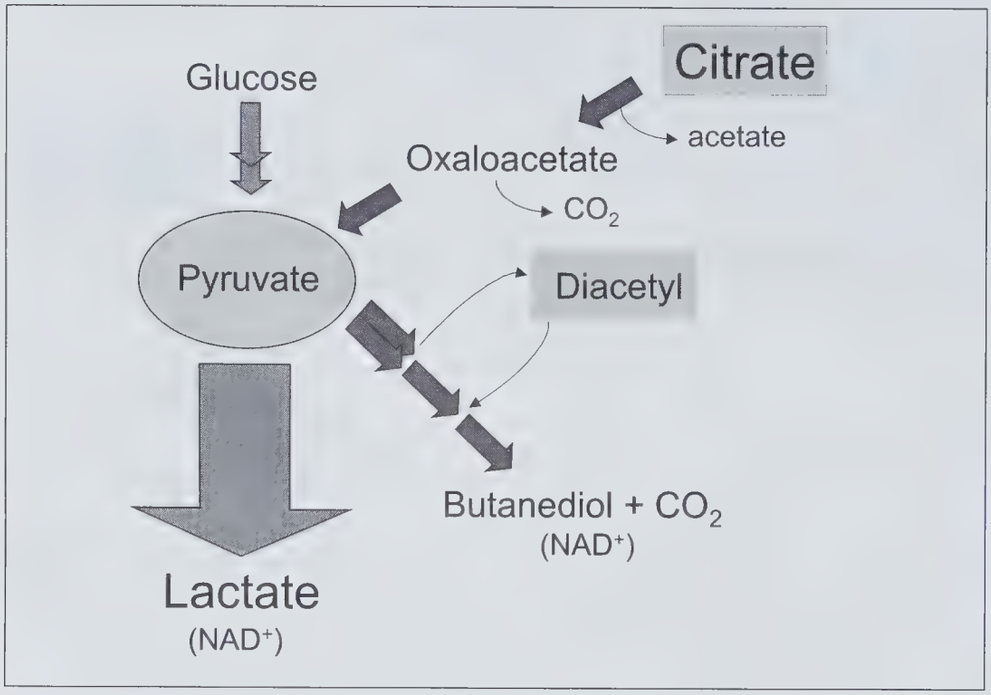


Figure II — Pyruvate metabolism
Courtesy of Dr. David A. Mills, Dept. of Viticulture and Enology, University of California, Davis

a topic of debate; however, the strongest evidence points to a single pathway, as shown in Figure I.[2,3]

Through this pathway, pyruvate is converted to α-acetolactate by the enzyme acetolactate synthase (ALS). α-acetolactate, being chemically unstable, spontaneously decarboxylates to diacetyl in the presence of low levels of O_2 (this is the same reaction that occurs in *S. cerevisiae*). In addition, diacetyl can be converted to acetoin and further to butanediol by butanediol dehydrogenase (BDH).

Pyruvate is the key precursor of the pathway. Pyruvate can be synthesized from several different sources, but those of most interest are glucose (or, fructose), and citrate, since these are the most readily available substrates at the beginning of ML fermentation (Figure II).

The importance of the relationships between malate and citrate metabolism lies in the relative activities of the reac-

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tions during the various stages of ML fermentation.

A study undertaken by researchers J. C. Nielsen and M. Richelieu at Chr. Hansen (ML bacteria supplier) illustrates that malate and citrate metabolisms are sequential (albeit overlapping) and that the maximum diacetyl level is actually achieved after malate is depleted (Figure III).[5]

Also of interest is the observation that citrate degradation roughly coincides with diacetyl formation. These findings contradict conventional wisdom surrounding ML fermentation. One would intuitively surmise that diacetyl builds up somewhat linearly until the "end" of ML bacterial activity, traditionally considered to be when malate is completely converted. This study shows that citrate metabolism in lactic acid bacteria (specifically in *O. oeni*) can continue on after malate is consumed.

It must also be remembered, however, that in order for diacetyl to be formed, α-acetolactate must first be chemically oxidized. If the O_2 level of the wine is higher, then diacetyl formation is favored.

Conversely, if the O_2 level is negligible (as in a highly anaerobic environment), diacetyl production will be low.[5] Under strictly anaerobic conditions, α-acetolactate is enzymatically decarboxylated by acetolactate decarboxyylase (ADC) to acetoin, preventing the formation of diacetyl (Figure I).

Controlling diacetyl levels in wine

The most practically useful finding by Nielsen and Richelieu is that diacetyl levels rise until all of the citrate is degraded, after which, diacetyl concentrations actually begin to fall. The decrease in diacetyl concentration occurs as a result of an enzymatic modification of diacetyl. Butanediol dehydrogenase (BDH) reduces diacetyl to acetoin and acetoin further to butanediol (Figure I). These two molecules have no sensory impact at the levels at which they are produced in wine.

Winemakers can deliberately decrease the apparent "butteriness" of ML-fermented wines by allowing the bac-

July 1, 2002 Bird Damage Control Bulletin

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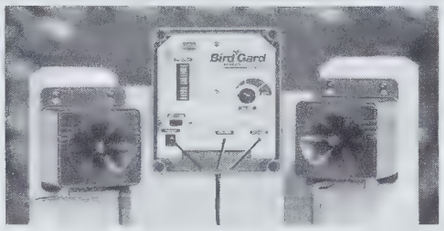

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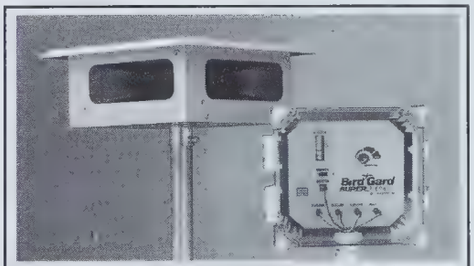

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teria to survive long enough for BDH to convert the diacetyl. This objective can be achieved by delaying the addition of SO_2 to a wine.

By waiting until after both malate and citrate have been exhausted to add SO_2, you allow ML bacteria to persist long enough to reduce the concentration of diacetyl. Lacking the capability to measure malate and citrate, one could instead wait until the buttery character of the wine diminished to add SO_2.

If, on the other hand, the addition of a lethal dose of SO_2 to *O. oeni* (as small as 10 ppm) is made just after malate is consumed (as is standard practice at most wineries) and before citrate is completely degraded, then no reduction of diacetyl will occur.[6] The bacterial cells will die and BDH will become inactivated; as a consequence, the wine will retain any diacetyl generated during the ML fermentation.

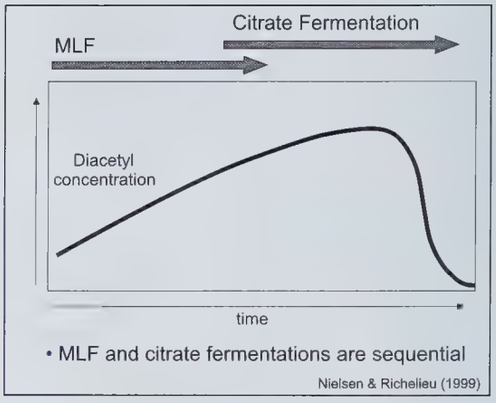

Figure III — Diacetyl formation and degradation sequence
Courtesy of Dr. David A. Mills, Dept. of Viticulture and Enology, University of California, Davis

As previously stated, *S. cerevisiae* can degrade diacetyl like *O. oeni*, but the extent to which *S. cerevisiae* can reduce diacetyl concentrations after ML fermentation has not been verified. If diacetyl were desired in a wine, making a higher SO_2 addition, sufficient to reduce the viability of *S. cerevisiae* (>0.825 ppm molecular) would probably prevent significant degradation from occurring.[1]

So, by monitoring the concentrations of both malate and citrate and timing the SO_2 addition properly, one can modulate the amount of diacetyl remaining in the finished wine. Whether or not diacetyl levels will fall depends on the ML bacteria (and perhaps, to a lesser extent, yeast) remaining alive so that enzymatic conversion can occur.

Some circumstances may make this strategy problematic, however. Keeping ML bacteria alive, even until all of the malate is consumed can prove difficult, especially in high alcohol or low pH wines. The degree of bacterial viability would likely influence citrate consumption and the production and degradation of diacetyl, as well.

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One last variable that can affect the apparent "butteriness" in wines is the SO_2 level. Not only can the timing of the SO_2 addition affect the level of diacetyl in wine, but the concentration of SO_2 can also affect the perceptibility of diacetyl. Since diacetyl has carbonyl groups, SO_2 can bind it and eliminate its sensory impact.

Large SO_2 additions can mask diacetyl much like SO_2 masks acetaldehyde. However, the reaction between diacetyl and SO_2 is exothermic and reversible, so diacetyl will be liberated from SO_2 over time and at elevated temperatures.[5]

The dynamics involved in ML bacterial metabolism present a strikingly different description from the popular view of ML fermentation. This latter view, that complete degradation of malic acid signifies completion of ML fermentation and that diacetyl is a requisite by-product, is only conditionally correct.

Evidently, more choices are available to winemakers than just ML+ or ML–. Although some conditions, such as stuck ML fermentation, may confound efforts to control diacetyl levels in wine, the potential for using this strategy in many cases can't be ignored. With the familiarity of the lesser-known mechanisms of ML fermentation, stylistic goals of winemaking can perhaps be more precisely expressed. ■

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WINERY LABORATORY QUALITY *by Sue Weeks*

Surviving harvest in a wine laboratory

*(**Editor's note**: Since so many winemaking practices are cyclical, recurring on a seasonal basis year upon year, it is often useful to revisit particularly relevant topics in these pages, adding to them as new knowledge or insights become available. This column adds significant new material to a column first published in the July/August, 2000 issue of **PWV**.)*

If there is a crucial time for good practices to be carried out in a winery laboratory, then harvest is it. Based on analytical tests conducted at this time, there are many decisions to be made (such as when to pick, when to barrel down, when to add sulfur dioxide, how much to add, how much acid to add, etc.). What can you do to ensure the accuracy of the methods you use during harvest?

The intent of this column is to provide helpful information for winery labs, from how to ensure a correct picking decision, to maintaining the laboratory equipment that is so important during the busiest time of the year.

First, let us note that many of the tasks suggested below should be performed before the first grapes are even picked. Most laboratories are far less busy just before harvest than they are once harvest begins. These checks should be performed slowly and methodically to ensure optimal performance.

Optimizing vineyard sampling

This procedure usually involves collecting a sample of berries from selected sites. The number of berries collected will depend upon the size of the vineyard sampled. Approximately 200 berries are sufficient unless you are using a brix hydrometer to measure the sugar level.

There are many quality density meters on the market that are capable of providing very accurate results with a small juice sample. More information about this instrument and its calibration and maintenance are discussed below.

Achieving a representative sample is the most important objective, as many decisions are based on the results. In order to achieve a representative sample, it is important to choose berries or bunches from different areas of the vineyard that may have differing exposure to sunlight. This can be done by sampling berries from top, bottom, back, and front of the bunches, or by sampling bunches in different areas of the vine.

The same vines/sites should be used in the sampling procedure each time, as this minimizes possible variation in the sampling. If you wish to count the berries to calculate average berry weight, it is not necessary to collect an exact number in the field. Count them at the winery where you can spread them on a tray.

It may also be a good idea to take an icebox or insulated container with you to store the berry samples that you have collected. However, be sure to let the berries reach ambient temperature before testing.

Analyzing the berries

Berries and juice can be analyzed for several different compounds in addition to the most common measurement of sugar content. Many wineries are starting to use results of these analyses to reward or penalize growers for grape quality. This trend is likely to increase in the future, so the accuracy of these measurements is critically important, given the financial implications.

Estimate of potential alcohol

The *approximate* alcoholic strength for a juice that is to be vinified can be calculated by multiplying the Brix by 0.6. Which means that a juice that is picked at 22° Brix will result in a wine that is approximately 13.2% v/v ethanol. This factor is based on the metabolism or conversion of sugar to ethanol by your "average" yeast. Of course the actual alcoholic strength will be dependent on the yeast used during fermentation, temperature, and storage conditions.

Free amino nitrogen or (Yeast Assimilable Nitrogen)

FAN and YAN are measured to monitor the nitrogen content of the must. This is to prevent fermentation problems and formation of sulphidic compounds caused by low levels of nitrogen. This method, which uses a standard UV/Vis Spectrophotometer, was developed by Bruce Dukes, in conjunction with Christian Butzke at UC Davis in 1998. A copy of this method can be obtained from the UC Davis website at http://wineserver.ucdavis.edu.

Color and Total Phenolics

The skin of red grapes is colored red or "black" due to the presence of colored pigments called anthocyanins. These pigments and other compounds give the grape its color. There has been much research on the correlation between grape and subsequent wine quality and the color measurements of the grapes. Color measurement is performed on homogenized fruit using a UV/Visible Spectrophotometer. The method can be complex and time consuming, but there are several local contract laboratories that can perform the analysis.

Accuracy of Brix measurements

Because sugar measurement is so critical — particularly during the pre-harvest and initial stages of harvest — it is important to ensure that the apparatus and technique being used are accurate. This can be done quite easily by making up some sugar solutions that fall within the range that you will be measuring. You can use AR grade glucose or fructose or, alternatively, ordinary table sugar (sucrose).

Table I shows the amounts to use to make up some solutions. The important thing to remember is that these amounts are weight/weight, not weight/volume, and you should **not** add an amount of sugar to a volumetric flask and make it up to the mark with water. You will get false-high results if you do this. These solutions can be used to calibrate hydrometers, refractometers, or density meters.

If what you use for measurement is not accurate, you have several alternatives. First, you can throw it out and buy another one! Some of the most accurate and well-made hydrometers are made in Australia by Carlton Glass (sales@carltglass.bu.aust.com). The current exchange rate may make them a good buy even including shipping. If the budget won't stretch even that far and the error seems proportional or the same across the range, you may be able to apply a correction factor.

If you are using a hand-held density meter and your results are not accurate, you may need to clean the barrel using warm soapy water, ethanol/water mix or even a mild acid, followed by copious quantities of purified water. Check the manufacturer's directions for guidance. Some of these meters also respond well to being stored with the barrel full of a water/ethanol solution.

The technique used during measurement should be reviewed at this stage. There are several factors that can affect the accuracy of the result during measurement, particularly if you use hydrometry. First is the size and placement of the measuring cylinder. If the measuring cylinder is not at least one inch greater in diameter than the hydrometer in use, the surface tension between the surface of the hydrometer and the wall of the cylinder will affect the result. In extreme cases, you can place the hydrometer at any given spot and it will remain there!

Another factor which can affect your result is whether the cylinder is level. Many wineries use a draining board or the sink for measurement of juice because the process is often sticky and messy. If the cylinder is not level during the measurement, a similar problem occurs in that the hydrometer is too close to the surface of the cylinder — leading to an inaccurate result.

A 250 mL measuring cylinder and a level bench top, rather than a sink or draining board are recommended. If you really need to use the sink, try placing the cylinder on the rim of the plughole. Hopefully that will provide you with a level surface and a non-messy solution to a sticky problem.

Another factor is cleanliness of the hydrometer. Hydrometers should be cleaned prior to harvest and once each week during harvest by soaking overnight in a proprietary non-ionic laboratory detergent. This procedure will remove any built-up grease or juice residue, and it will improve accuracy of the measurement. Remember to rinse the hydrometer with plenty of water prior to use.

pH measurement

We will discuss pH measurement in great detail in the next column, but for now we shall simply say it is one of the most important measurements performed during harvest. How do we ensure that the pH meter, particularly the electrode, is performing correctly?

During vintage, electrodes can be clogged with grape solids, and the flow of ions from one electrode to another can slow or cease altogether. This is particularly likely if you use an electrode that has a porous plug or any other type of physical barrier.

Table I. Suggested concentrations for Brix solutions

Brix	Grams of sugar/per 1000g water	for 500g solution
5	50	25g in 475g H_2O
10	100	50g in 450g H_2O
15	150	75g in 425g H_2O
20	200	100g in 400g H_2O
25	250	125g in 375g H_2O

If you analyze many juice samples, it might be wise to invest in an electrode that has an outer sleeve that can be easily cleaned or removed. These electrodes are generally more expensive, but they last longer and require less maintenance — particularly during harvest when time is precious anyway. These electrodes also come in models that are made of epoxy resin rather than glass. This protects the electrode and makes it virtually indestructible.

Acid standard

Acidity is another critical measurement during harvest. It is used to determine the time of picking and for calculating additions of tartaric acid. In order to determine the accuracy of your measurements, it is necessary to prepare a standard solution — 5g/L is sensible. It is also wise to use analytical reagent grade (AR) tartaric acid and a calibrated balance to make sure that your standard is accurate. The standard is titrated to pH 8.2, just like a normal acidity measurement, and the expected result after calculation is 5g/L. If you do not achieve this result, the problem could be in any of several areas:

- Impure standard material
- An electrode or pH meter problem
- Inaccurate sodium hydroxide (titrant)
- Insufficient stirring during the titration
- Operator error

Making good use of the guidelines cited above should help make the 2002 harvest a little less stressful, and it will undoubtedly improve your confidence in the laboratory's results. It will also save potential downtime during harvest, when time is the most precious commodity of all. Have a great harvest! ■

Sue Weeks is an Australian wine laboratory consultant. She provides assistance in areas of formal or informal quality system implementation, method validation, and troubleshooting, laboratory setup, personnel selection, and staff training. She also facilitates international wine-industry training in conjunction with the Communicating for Agricultural Exchange Program (CAEP), in Fergus Falls, MN. She visits America often and can be contacted through the Bibber International website at www.bibber.com.au or by fax at 618/8563 2422. She can also be contacted through Gordon Burns at ETS Laboratories (St. Helena, CA) at tel: 707/963-4806.

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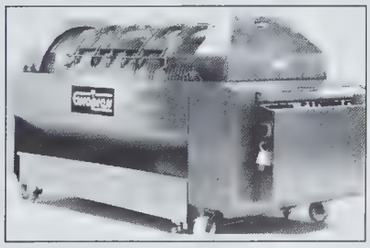

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PHONE: 540/825-5700
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4950 Fulton Dr. #E
Suisun City, CA 94585
PHONE: 707/864-5800
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www.euromachinesusa.com

Pacific Southwest Container

Founded in Modesto, CA, in 1973, Pacific Southwest Container (PSC) has grown from a small, family-owned business to a 500,000-square-foot powerhouse. PSC designs and produces custom product packaging solutions, including corrugated, single-face lamination, protective packaging, and folding cartons, for a variety of clients.

As one of the west coast's largest independent paperboard converters and foam fabricators, PSC purchases raw materials and supplies on the lowest cost basis. PSC manufactures and warehouses its customers' packaging to provide delivery on a 24-hour schedule.

PSC produces nearly 1,000 jobs per month, including 100 to 200 brand new designs.

This aggressive production capacity requires a teamwork approach to understanding and meeting customers' needs. PSC's sales and customer service representatives work closely with clients and interface directly with in-house design and manufacturing departments to ensure projects are completed to specification and budget.

PSC has received the ISO 9001 certification for its commitment to quality — every stage of its quality system has been thoroughly examined against the most exacting set of internationally recognized standards.

Because PSC is continually focused on improving production quality, speed, and dependability, staff members strive to meet an even higher standard than ISO 9001 ... customer satisfaction.

For more information, contact:

Pacific Southwest Container
Bryan Smith
4530 Leckron Rd., Modesto, CA 95353
tel: 800/772-0444; fax: 209/522-8746
e-mail: bsmith@teampsc.com
website: www.teampsc.com

PLEASE SEE PACIFIC SOUTHWEST CONTAINER'S AD, PAGE 29.

Lafitte Cork & Capsule, Inc.

Lafitte Cork & Capsule, Inc., is one of the leading companies in California supplying natural corks and quality capsules.

Lafitte Cork & Capsule is a subsidiary of Lafitte Industries along with Lafitte Cork Portugal, an ISO 9002-certified cork manufacturer producing and distributing more than 400 million corks annually around the world.

Extensive quality control procedures and an on-site $4 million inventory make Lafitte one of the most reliable and competitive cork suppliers in the industry.

Lafitte capsules are produced in France by C.M.E. (Coliege Metalco Emballage). These are high quality PVC, tin, or polylam capsules, which offer unique printing reproduction, such as nine-color decorated PVC capsules.

In addition, an all-metal ECOCAP capsule provides the performance of tin capsules with 20% cost savings.

For more information, contact:

LaFitte Cork & Capsule
45 Executive Court, Napa, CA 94558
tel: 800/343-CORK, 707/258-2675
fax: 707/258-0558
e-mail: brucker@lafitte-usa.com
website: www.lafitte-usa.com

PLEASE SEE LAFITTE CORK & CAPSULE'S AD, PAGE 27.

Jonergin Pacific

Jonergin Pacific offers exceptional, consistent quality and on-time delivery at a competitive price.

JONERGIN
PACIFIC

Specializing in providing superior quality printing of pressure-sensitive wine labels, Jonergin Pacific uses eight-color waterless offset technology with inline multiple foil hot stamping, multiple embossing, multiple rotary screen, multiple coating, and rotary or flat die cutting.

Jonergin, Jonergin Pacific's sister division, specializes in sheet-fed litho, flexo, and letterpress technologies to provide very competitive glue-applied and pressure-sensitive label solutions to the wine industry, and offers special expertise in metalized papers.

With a highly focused and experienced staff in all aspects of wine label printing, substrates, adhesives, and the label application process, Jonergin Pacific is dedicated to providing craftsmanship, innovation, quality, and service.

Call Jonergin Pacific to arrange a facility tour and capability presentation in Napa. Visit the climate-controlled, environment-friendly pressroom and well-equipped pre-press department. Meet the company's team of wine label experts to discuss Jonergin Pacific's capabilities in label application and your labeling specifications.

For more information, contact:

Jonergin Pacific
1901 N. Kelly Rd., Napa, CA 94558
tel: 707/226-2806; fax: 707/226-2894
e-mail: tsibley@jonerginpacific.com

PLEASE SEE JONERGIN PACIFIC'S AD, PAGE 13.

Wine Cap Company

The Wax Cap™, from the Wine Cap Company, is one of the finest wax enclosures available. Discriminating wineries around the world appreciate the Wax Cap closure system's incomparable graphic designs, clean and reliable application, low cost, and its benign effect upon the environment. Wax Cap application can far exceed other forms of wax application in speed and efficiency with production speeds exceeding 350 bottles per minute.

The Wine Cap Company recently expanded production with operations beginning in Italy this past year. European production provides an economical Wax Cap source for the European market and security for current customers with a secondary production facility capable of supporting the U.S. operations.

The Wax Cap continues to be one of the most environmentally- and consumer-friendly closures available. The Wax Cap is made from "direct food contact" approved waxes, produces no harmful emissions, and has been approved by the European Union for use as a wine closure.

Elegant graphics, low cost, and reliable application make the Wax Cap an outstanding choice for your package. Please call the Wine Cap Company, who will provide you with one of the finest wax closures available and superior responsive service.

For more information, contact:
Wine Cap Company
Phillip Staehle, Janie Mumm
21787 Eighth St. E, #3, Sonoma, CA 95476
tel: 707/939-3930; fax: 707/939-3934
e-mail: info@winecap.com
website: www.winecap.com

PLEASE SEE WINE CAP COMPANY'S AD, PAGE 42.

Remo Scagliotti – Printing Broker

Remo Scagliotti commenced his career in the printing industry as an instructor in offset printing at a trade high school. Today, 40 years later, he is able to draw upon extensive experience acquired in all aspects of the printing industry, including silk screen printing, book publishing, label printing, and as an owner/operator of his own quick-print and commercial printing companies.

Since moving to Sonora, CA, in September 2001, he has established a printing brokerage business providing high-quality sources for a wide selection of wine labels and wine shipping/packaging products. He is prepared to offer these products to grapegrowers and winemakers in Northern California.

Most importantly, he will do his utmost from the proofing stages to the shipping of your labels to meet the demands of your bottling schedules. This hands-on approach will give you the confidence that your labels will be produced with the same attention you give in producing your wines.

Remo Scagliotti not only looks forward to printing your wine labels, he also looks forward to sampling your fine wines. Until that time, as his father from Piemonte, Italy, taught him, "salute per tutti!"

For more information contact:
Remo Scagliotti – Printing Broker
PO Box 4267, Sonora, CA 95370
tel: 209/532-4563; fax: 209/532-4510
e-mail: remoingldcntry@sbcglobal.net

PLEASE SEE REMO SCAGLIOTTI'S AD, PAGE 25.

SupremeCorq

SupremeCorqs have been preserving wines and winemakers' reputations around the world since 1992 and are among the best synthetic closures available.

SupremeCorqs come in three sizes: 45mm, 38mm, and T-Top. Each is recyclable and complies with FDA and EU regulations. SupremeCorq's proprietary technology has resulted in more than 15 patents worldwide.

Available in 12 standard colors and any custom color, SupremeCorqs can greatly enhance wine packaging. With a variety of different colored, FDA-compliant inks that don't rub off, SupremeCorqs' printing capability is unmatched.

Made from superior food-grade thermoplastic elastomeric materials using the highest quality molds and produced under the strictest ISO guidelines, SupremeCorqs have excellent structural integrity and oxygen-barrier ability. They are neutral and do not impart flavor or support microbial growth.

SupremeCorqs are injection-molded. The outer skin completely seals the closure, protecting the internal cell structure and preventing wine absorption. The closure conforms readily to the surface of the bottle bore, insuring a proper seal. SupremeCorqs will not crumble in bottles or chip on production lines.

Each SupremeCorq is quality-tested for density (length, weight, diameter), coating consistency, and insertion/extraction force to ensure optimum product performance.

SupremeCorqs form a near-perfect seal so leakage, evaporation, and musty off-flavors experienced with other closures are virtually eliminated. SupremeCorqs can be used easily on your existing bottling line, and bottled wine can be stored upright.

More than 1,000 wineries the world over use SupremeCorqs to preserve their wines exactly as their winemakers intended.

For more information, contact:
SupremeCorq
5901 S 226th St., Kent, WA 98032
tel: 800/794-4160 or 253/395-8712
fax: 253/395-8713
website: www.supremecorq.com

PLEASE SEE SUPREMECORQ'S AD, PAGE 39.

Caliber Wine Group

The Caliber Wine Group — a trusted supplier to the wine industry since 1982 — offers a full range of top-quality wine bottles manufactured domestically by Saint Gobain Containers, one of the world's largest producers of glass containers.

CALiBER WINE GROUP

Caliber is a leader in custom bottle design and maintains strong supplier alliances with manufacturers around the globe to provide customers with the utmost in selection, style, and quality.

Caliber offers customers a complete range of high-quality packaging products at competitive prices. For an overview of the many new items that have been developed over the past year, please visit Caliber's website at www.caliberwine.com.

For more information, contact:
Caliber Wine Group
603 Indiana, Benicia, CA 94510
tel: 800/374-6594 or 707/747-1055
fax: 707/747-1064
PLEASE SEE CALIBER'S AD, PAGE 48.

Cork Supply U.S.A., Inc.

Cork Supply U.S.A. (CSU), a leading supplier of premium wine cork, is ISO 9002-certified, as is Global Quality Assurance, its laboratory in Portugal.

This year, CSU has invested in Equipar, a partnership with cork growers who own 12% of the Portuguese cork forest, which enables the company to control cork quality from "Forest to Bottle."

CSU products include Alpha corks (hydrogen peroxide wash), Natura corks (potassium metabisulfite wash), 1+1 corks, colmated corks, sparkling wine corks, and large diameter corks for oversized bottles. Designs may be printed or fire-branded (including cork ends).

CSU has implemented the use of Solid Phase Micro Extraction to detect TCA in cork lots. CSU's Portuguese Quality Assurance laboratory has installed a GC/MS to scientifically qualify cork lots before purchasing. Furthermore, as a Cork Quality Council member, CSU does additional SPME testing at a local enological laboratory to assure customers of the cleanest cork lots.

Corks are coated in its Precision Plus Coating system, which enables the company to fine-tune coatings for optimum performance on each winery's bottling line. CSU has added inspection tables into the production system to allow a final check of all corks immediately prior to bagging for shipment to wineries.

The expanded Triple Quality Assurance program, along with a modern, highly technical production system, and responsive customer service insures consistent, exceptional cork quality and on-time deliveries to CSU customers.

For more information, contact:
Cork Supply U.S.A., Inc.
537 F-Stone Rd., Benicia, CA 94510
tel: 707/746-0353; fax: 707/746-7471
e-mail: sales@corksupplyusa.com
website: www.corksupplyusa.com
PLEASE SEE CORK SUPPLY U.S.A.'S AD, PAGE 2.

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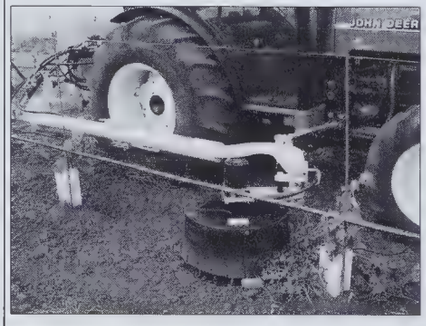

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California Glass Company

California Glass Company and affiliates offer a comprehensive range of packaging goods and services to the wine industry, both nationally and internationally. The Cal Glass family represents Owens-Illinois Glass Containers and St. Gobain USA, North American manufacturers of wine bottles, and offers private and stock molds from numerous European and domestic manufacturers.

Cal Cork™
A Product Line of California Glass Company

The combined companies maintain one of the largest sales and support staffs in the U.S. to address wine industry needs. Technical service representatives are available to troubleshoot line problems. An in-house graphics department can, in conjunction with your graphic design firm, turn artwork into a printed carton with minimum lead-time.

Products include: bottles, wine glasses, label and case-seal adhesives; tin, polylaminate, and PVC capsules; plain and branded corks including Duo Disc® technical corks, all from Cal Cork™; plus Ship & Store® wine packs, specialty corrugated cartons, and basket carriers.

Services include ACL decorating of glassware and bottles, up to three colors on both sides. Any PMS color including bright metallics can be matched.

Cal Glass is the exclusive west coast source for Avery Dennison Clear Advantage® labels, a patented heat-transfer decoration, with four-color process and photographic image capabilities. Direct-print up to six colors including bright metallics. Clear Advantage® is pasteurizable, scratch-, chemical-, and fade-resistant.

For more information, contact:
California Glass Company
tel: 510/635-7700; fax: 510/638-7624
website: www.calglass-pcc.com

Contacts: domestic wine packaging, **Terry Sanzo** (ext. 172) or **Guy Gianino** (ext. 169); imported wine packaging, **Cindy Silvani** (ext. 122); corks, **Kim Murphy** (ext. 159); capsules and adhesives, **Mark Walheim** (ext.171); stemware and decorated glass, **Guy Gianino** (ext. 169); cartons and graphics, **Sean Tachco** (ext. 124)
Pacific Coast Container (WA)
tel: 360/892-3451; fax: 360/892-4955
Contacts: Bernie Petays or **Gary McMahon**
Colorado: tel: 303/485-5149
fax: 303/485-5206

PLEASE SEE CALIFORNIA GLASS'S AD, PAGE 19.

Ramondin USA, Inc.

Ramondin is an excellent choice for tin capsules. This is Ramondin's only product, and the experts at its factory have been manufacturing capsules for wine bottles for over 100 years. Ramondin considers tin the best material for performance and creative integrity. The flexibility of tin makes for a smooth finish on your bottle without seams or wrinkles.

Ramondin's factory is one of the most modern in the world with a new generation of machines that can do amazing things with paint, providing an additional canvas for artistic expression on your wine bottles.

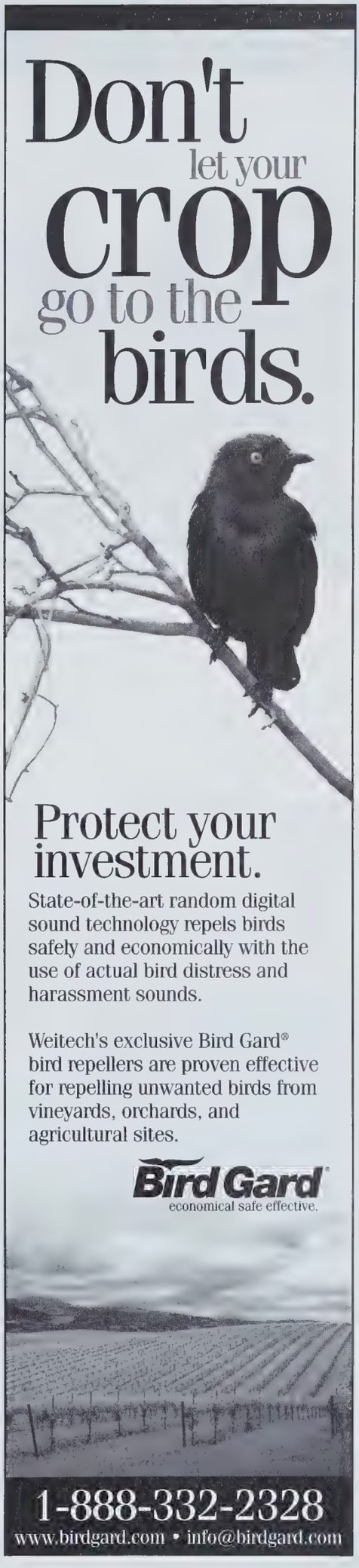
Ramondin can help you create your new package from start to finish. Ramondin will measure your bottles to determine the correct size for the perfect fit.

If you have a very small project with a limited time frame, stock capsules are available in 11 colors from the Napa warehouse waiting for your order.

Not only is Ramondin's quality unequaled in the world of wine capsules ... its service is the best. That's because there are no brokers and no middlemen. Ramondin staff knows the status of your orders from the first day until delivery. Ramondin is at your service! "Give Ramondin a call!"

For more information, contact:
Ramondin USA, Inc.
2557 Napa Valley Corporate Dr., Ste. G
Napa, CA 94558
tel: 707/944-2277; fax: 707/257-1408
e-mail: ramondin@ramondinusa.com

PLEASE SEE RAMONDIN'S AD, PAGE, 3.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Jeffrey Caldeway Design & Marketing

Jeffrey Caldeway heads a full service agency (JCD&M) specializing in brand identity, package design, image development, and market support of "consumable luxury brands." Clients range from mass marketers to boutique wineries.

"In a world of luxury consumption, wine has become a primary cultural icon," states Caldeway. "It reflects a nobler era venerating the virtues of an artisan-made product, produced from hand tilled soil, in rhythm with the seasons."

The idea of personality is at the core of Caldeway's designs as they translate the personal vision of a client into a highly desirable, world-class brand. The key is to add value to the brand by giving it a sense of mystique.

"All aspects of brand development stem from the packaging," explains Caldeway. "It is part symbol, part memory, and part storytelling. A successful package can be defined by both visual and textural cues. The 'look' must be dramatic and elegant, earthy and romantic. The 'feel' must be substantial — exuding both style and substance."

"Not only does the package personify the personality of the product; it has the power to transform our own sense of identity."

For more information, contact:
Jeffrey Caldewey Design & Marketing
5301 Redwood Rd., Napa, CA 94558
tel: 707/252-6666; fax: 707/252-6742
e-mail: jcaldeway@aol.com

Saverglass, Inc.

Saverglass has introduced stock Stelvin bottles to the U.S. Stock versions of the Burgundy, Bordeaux, and Flute bottles are available from inventory in France and bottles have been produced in a variety of glass colors.

There are more than 10 new bottles to choose from which can be viewed at Saverglass' Napa, CA, office by appointment or online at www.saverglass.com.

Saverglass is proud to announce that a second factory is now in production at Le Havre and that the company now has the ability to offer more to the U.S. market than ever before with shorter lead times and greater flexibility.

Based on its growth in the eastern U.S.'s wine and spirits industry, Saverglass has added a new East Coast office for customers east of the Rockies. Contact Daniel Repoux at 914/636-3443 in the New York office for more information. For samples of Saverglass's new products, call the California office at 707/259-2930, or visit the website at www.saverglass.com.

For more information, contact:
Saverglass, Inc.
West Coast
Erica Harrop, VP Sales & Marketing
Terri Abrahamzon Lee, Packaging Consultant
Sylvie Langlois, Packaging Consultant
860 Napa Valley Corp. Way, Ste. S
Napa, CA 94558
website: www.saverglass.com
tel: 707/259-2930; fax: 707/259-2933
East Coast
Dan Repoux, President
tel: 914/636-3443

PLEASE SEE SAVERGLASS AD, PAGE 33.

Midcal Packaging Technologies

Over its 42-year history, Midcal Packaging Technologies (MPT) has become an innovative manufacturer of a variety of packaging closures. MPT supplies products and services to a growing number of wineries in the U.S., Canada, and Mexico.

MIDCAL
PACKAGING TECHNOLOGIES

The company's diverse portfolio includes: roll-on pilfer-evident aluminum caps, corks, capsules, injection-molded products, and other closure materials.

Laboratory testing has demonstrated that MPT's proprietary cork washing and bleaching system, SUBER-RAIN™, improves sensory performance, while reducing dust "up to 60% more than the competition." Each cork lot is subjected to stringent sensory evaluations. The cork sensory process relies on two separate laboratories, where sensory data is evaluated at three different steps during cork processing. MPT offers all types of still wine and sparkling wine corks, including bar/bulb tops.

In addition to cork processing, MPT produces aluminum roll-on pilfer-evident caps printed with up to five colors (one base color plus four printed colors). With a total of three liner capabilities, MPT can match the best liner options to your unique packaging needs. The company's exclusive printing method provides "tight" register printing, undistorted side printing, short delivery lead-times, and minimal set-up costs.

Cap sizes range from 25 mm to 38 mm diameter, both long and short flange.

For more information, contact:
Midcal Packaging Technologies
500 S. Santa Rosa Ave., Modesto, CA 95354
tel: 888/264-3225; fax: 209/341-3034
e-mail: lee.mcdonald@midcalusa.com
website: www.midcalusa.com

PLEASE SEE MIDCAL PACKAGING'S AD, PAGE 17.

Buttita Design

Award-winning packaging and marketing materials result from creative thinking at Buttitta Design. Many producers in the wine industry have benefited from Buttitta Design's innovative style and cost-effective approach to graphic communication and marketing.

When Landmark Vineyards needed a new "look" to characterize its improved wine style, Buttitta Design created a unique visual identity for the winery that retained a key "equity" element from the old package. The new label recently won an Award of Excellence from America Corporate Identity. Three other wine packages also garnered awards for the firm this year; Laurel Glen's Zazin and Quintana, and the redesigned Lakespring label.

"We believe packaging is more than just the wine label on the bottle," says director Patti Buttitta. "Advertising and marketing materials are also part of the essential product packaging." In that vein, Buttitta Design produces press kits, brochures, newsletters, catalogs and other marketing materials. "We recognize too, the important link web design makes in the whole packaging mix."

Special attention to detail and careful management of projects are hallmarks of Buttitta Design. The creative team has developed successful programs for its clients, including Lambert Bridge Winery, Laurel Glen Vineyard, Mauritson Wines, and Sterling Vineyard School of Service and Hospitality.

For more information, contact:
Buttitta Design
132 Matheson St., Healdsburg, CA 95448
tel: 707/431-1257

PLEASE SEE BUTTITTA DESIGN'S AD, PAGE 47.

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Amorim Cork America

Amorim Cork America (formerly Cork Associates) is the U.S. representative for Amorim and Irmaos of Portugal.

Since 1870, the Amorim family has been committed to the cork industry and has become one of the world's largest producers and suppliers of cork stoppers. Amorim operates a major research and development program, investing heavily in scientific research, laboratory testing, modernized processes, and innovation.

Amorim Cork America offers a full line of natural cork products.

For still wines, standard 24mm diameter corks in 38mm, 45mm, 49mm, 51mm, and 54mm lengths are available in two washes: BWC + (hydrogen peroxide) wash or Natural (meta-bisulfite) wash. In most lengths, five distinct grades for various quality and price ranges are in stock.

For sparkling wines, Amorim Cork America offers the Spark® cork with disks washed by the Inos II four-part sanitization system that eliminates off aromas from wine contact surfaces of corks.

Twin Top® corks are one of Amorim Cork America's major products and utilize the same technology as Spark® corks. This is a closure with an agglomerated mid-body and an Inos II-washed disk at each end that is widely accepted in the wine industry for its consistency of size, performance, and sensory neutrality.

Amorim Cork America is a member of the Natural Cork Quality Council. All corks are QA-screened via CQC standards and subject to SPME sampled GC/MS testing for TCA at ETS Laboratories prior to acceptance into inventory.

For more information, contact:
Amorim Cork America
2557 Napa Valley Corporate Dr., Ste. A
Napa, CA 94558
tel: 707/224-6000; fax: 707/224-7616
e-mail: chris@amorimcorkamerica.com
website: www.amorimcork.com

PLEASE SEE AMORIM CORK AMERICA'S AD, PAGE 18.

Etched Images

Etched Images, located in Napa Valley, deep etches and paints wine bottles with your logo, label, or message. Precise processing assures your bottle makes a lasting impression, whether for winery label reproduction to give you a marketing advantage, or as a corporate gift.

ETCHED IMAGES

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- 55°F refrigerated wine storage.
- Etched Images is a bonded warehouse (BW 5999 CA).

For more information, contact:
Etched Images
Kathy Jennings
1758 Industrial Way, Ste. 101
Napa, CA 94558
e-mail: kathy@etchedimages.com
website: www.etchedimages.com

PLEASE SEE ETCHED IMAGES' AD, PAGE 16.

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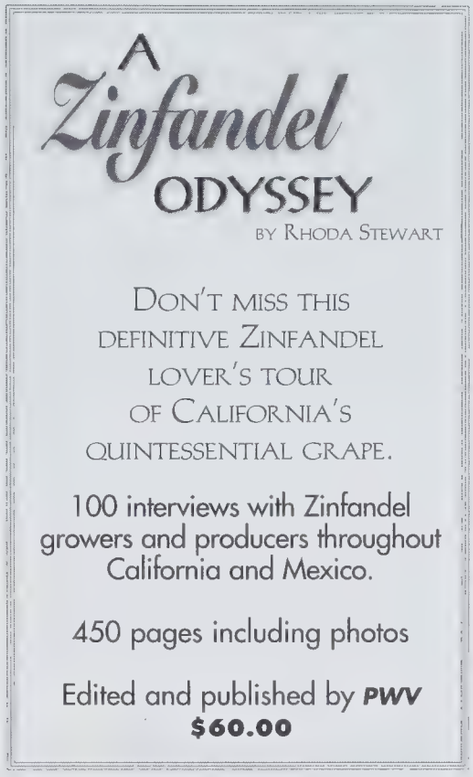
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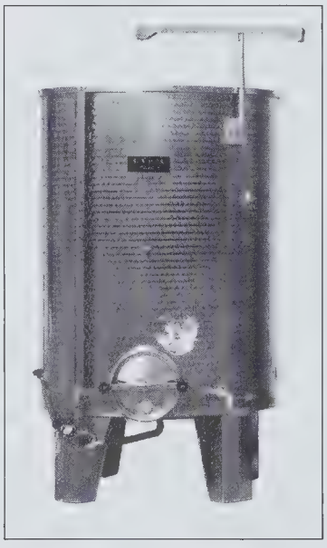

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Sanford Winery
Continued from page 30

drip irrigation to 137 acres of vineyard, or the adjacent four-acre tree farm and 130-acre lima bean field. Solids generated during the screening and aerobic process are composted and applied to the vineyards as a soil conditioner and supplemental nutrient source and disked under routinely. These treatment processes provide for disposal of the process wastewater with minimal disturbance or pollution of the environment. They also reduce odor nuisances, prevent contamination of surface and ground waters, and allow for beneficial reuse of the water.

The capacity of two 600,000 gallon aeration ponds (located on an adjacent property) was decided upon by considering pond water balance with respect to process wastewater quantities, rainfall, evaporation, and projected effluent irrigation disposal.

Harvest 2001

The 2001 harvest went off without difficulty. However, the crush pad at the new facility was not completed, so crushing occurred in the red fermentation building, using the existing portable equipment.

"We prefer to use portable crush equipment because technology changes quickly," explains D'Alfonso. "Working this way makes it easier to adapt the facility as necessary. When we are not crushing, we can put it away and use the space for other things and maintain the look of the facility."

Looking forward

"The Sanford Winery is a good example of form following function," according to the architect, Robert Mehl (RPM Architects, Santa Ynez, CA). "To a great extent the building types and layouts follow the flow of the wine production."

D'Alfonso is sure that the new facility will make the winemaking process much more efficient than at the previous processing site. But more than just making their job easier, the facility will affect how the workers feel about the work they do. By having a more efficient work area, the workers are more motivated than ever to produce quality wine. In addition, in a facility steeped in beauty and nature, one cannot help but feel inspired. ■

Deidre Booth, Summit Engineering's marketing manager, has worked with winery consulting engineers for two years and is the author of several articles for the engineering community.

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SMART VITICULTURE *by Dr. Richard Smart*

Yield limits for vineyards – mandated inefficiency?

Did you hear the story about the grapegrower who walked into a winery at crush and demanded that the enologist extract only 100 gallons of wine from each ton of his grapes? To extract any more, he said, would be to compromise the wine quality.

I don't hear that story much, but I have heard the following one many times: An enologist (or winery field rep) walked into the vineyard and asked that yield be lowered to three tons per acre, when a six-ton per acre crop was hanging. The higher yield, he said, would compromise wine quality.

Grape surplus – need for higher quality? or less fruit?

There are stories of large grape surpluses for the 2002 harvest in California. This is particularly acute in the Central Valley for Cabernet Sauvignon, but each region will likely have problems. During my stay at Cal Poly State University (San Luis Obispo), I heard stories of problems (potential surpluses) with Cabernet Sauvignon on the Central Coast. The same was true for Australia for the 2002 harvest, but an overall low volume vintage reduced the pressure towards the end.

Not unexpectedly, at times of potential surplus, the pressure is on growers to limit yields. I am never sure if the yield limits are meant to possibly improve quality or merely to reduce the wineries' obligation to take fruit for which they may have no wine market.

In this column I want to review the situation regarding vineyard yield and wine quality.

Vineyard yield and wine quality

The notion that low yielding vineyards make better wine is quite widespread throughout the world. I think it is European in origin, and probably French. The idea dates back to Roman times: "a struggling vine makes the best wine." Yield limits are defined under AOC appellation systems in France.

Many have questioned, however, whether quality can be imposed by legislation. The important issue to examine is whether low yields guarantee high quality. Does removal of some fruit guarantee the remainder will have improved quality? In the remarks that follow, I will principally concern myself with red wines, though I believe that the same principles generally apply to white wines.

It is my observation that many of the world's great red wines are grown with some stress. This is typically a water stress — enough to stop shoot growth before veraison and to limit lateral leaf growth. I believe that, if the stress is mild, then there is only a small effect on yield.

However, a considerable amount of stress can greatly reduce yield, with a corresponding reduction in quality. I have seen severely moisture-stressed vines struggling to ripen fruit. Some leaves have fallen off, and the remainder are yellow. It is obvious that the leaves are hot and stomates are closed, so the remaining leaves are not working efficiently. It is indeed naïve to assume that maximum stress gives maximum quality.

Is it the lower yield or the mild stress which promotes quality? Or maybe a combination of both? I think we must be very careful to separate these effects. It is my opinion that *the stress that causes lower yield is more likely to lead to higher quality than is the lower yield itself.*

Let me clarify with an example: Imagine a vigorous Cabernet vineyard grown on deep soil and carrying an eight-ton per acre crop. Will quality be improved by thinning to four tons per acre? I doubt it. More likely the vines will be put even more out of balance, and the fruit probably even more shaded.

In this instance, I think the grower should be more concerned about affecting a modicum of stress at the right time, rather than merely dropping fruit. In other words, the excess of shoot tips growing at veraison are more likely to damage quality than are a purported excess of grapes.

Small berries, are they important?

I also think the contribution of small berries to wine quality is over emphasized. Certainly, a small berry has a larger surface-area-to-volume ratio, and so more skin to juice. But across the range of commercial berry sizes these changes are relatively small.

Researchers in Australia have made wine from large and small berries within loads and found no difference in composition and quality. I think that *it is the factors making berries small that lead to quality, and not the small berries themselves. Small berries are a sign of stress.*

Water stress — especially before veraison — will cause smaller berries. Crop thinning at this time will cause larger, not smaller berries. The easiest way to have small berries is by minimal pruning, but I believe that few enologists will endorse this practice!

Some experimental results

I have investigated the relationship between yield and quality in several experiments, in both hot and cold climates. One of my first trials was with Syrah at Angle Vale in South Australia, a hot region like California's Central Valley. I compared a high yielding Geneva Double Curtain (GDC) to an open canopy with a "sprawl canopy" that was shaded.

The results were clear, and dramatic. The higher yielding GDC at 11 tons per acre produced wine with better color and phenols than did the sprawl at nine tons per acre. The respective sensory scores in a replicated tasting using wine industry judges was 15.4 ex 20 and 11.9 ex 20.

I have found similar trends in cool climates. As an example, a trial with Cabernet Franc in New Zealand showed that a high yielding, open canopy carrying 12 tons per acre made better wine than a shaded vertical shoot positioned (VSP) trellis with six tons per acre. There was lower pH, more color, anthocyanins, and phenols for the higher yielding vines, and the sensory scores were 5.1 ex 7 for high yield and 3.5 ex 7 for low yield.

I have seen other results with similar outcomes. For example, many fruit thinning trials show little or no benefit on fruit composition.

Balanced vines are important

I believe that balanced vines make balanced wine. A balanced vine will have appropriate leaf area to ripen grapes, but not so much as to cause shading. Vine balance is achieved by using the correct trellis system and pruning level for the site, and maybe some other practices, such as irrigation management and cover cropping, to produce a modicum of water stress.

Are there exceptions?

In my experience there are some varieties that indeed seem yield-sensitive in relation to quality. The best example is Pinot Noir. I am unaware of any premium quality Pinot Noir being made from a moderate to high-yielding vineyard. It seems that this variety requires a larger than normal leaf-to-fruit ratio to produce quality wine. Pinot Noir seems as fussy about its yield as it is about where it is grown.

There are a few other examples, typically with large berry and large clustered varieties like Zinfandel, Merlot, and Tempranillo. These varieties can set crops larger than they have leaf areas to ripen, so composition is improved by crop thinning.

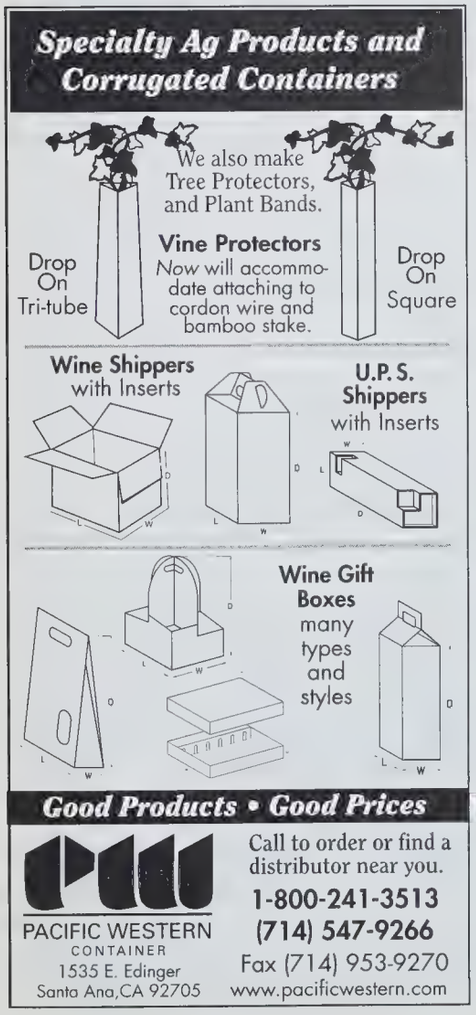
The future

I doubt that many winemakers will take seriously what I say above. Perceptions about yield and wine quality are deeply ingrained, and often repeated by wine writers. So growers can look forward to being requested to limit their efficiency (and income) by dropping crop while the market is tight.

I do believe, however, that in 10 years things may be different. There will be more use of winery-based measures of grape composition and quality, as, for example, in grape color. New instruments using near infrared spectral analysis show great promise for real-time quality assessment during grape receiving at the winery. I also suspect that there will be more field trials looking at the relationship of yield to quality, especially looking at crop thinning.

For the moment, I can offer winemakers a tip. Within any one region of similar climate, and for any given variety, the first vineyards to ripen often make the best wine. Harvest date can be a better indicator of quality than can yield. I think that more attention should be paid to irrigation practice and canopy management and vine balance, and less to yield. That will be to everyone's ultimate benefit. ■

Dr Richard Smart, "the flying vine-doctor," is an international viticultural consultant based in Australia. He is also the Visiting Professor of Viticulture at Cal Poly, San Luis Obispo, CA. He can be contacted by e-mail at: vinedoctor@compuserve.com. Read about Dr. Smart's business including his consulting schedule, educational wine tours, and seminars at his home page http://www.smartvit.com.au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WHERE IS MY FOSSE SEPTIQUE?

As a matter of professional pride, the site utilities for our recently purchased house in Provence were closely scrutinized prior to final completion of the real estate transaction. No holes were dug to check sewer alignments and slopes, but the French "notaire" (French equivalent of a title company officer) assured me that all was in order and functioning perfectly.

The fosse septique *(or F.S.-French for septic tank) was located with a broad sweep of his hand. After the papers were signed, a few test holes failed to reveal the F.S. Monsieur Nööel, the people's choice for the best local "*plumbier,*" recalled having worked on our system many years ago, but he drew a blank on the tank's location.*

My obsession with this plumbing mystery was focused, not only on the location, but the size (capacity) that had been installed and the level of accumulated residual biosolids (formerly called sludge) in the tank.

With a backhoe that was on the property for another task (uprooting apricot tree stumps) and an operator who handled the controls with the precision of a neurosurgeon, we began a series of test holes until the F.S. was discovered. The tank contents were assessed and pumping was arranged for a later date.

There are vast differences in plumbing practices between France and the U.S. For example, there is no roof clutter there from emerging plumbing fixture vents, as most fixtures in older homes are not vented. What this means is that with the proper combination of sink, shower, or W.C. (water closet) use, a vacuum can be created in the collection system, pulling the water barrier in the P-traps down the drain. The odor assault that would occur with the loss of P-trap contents would be beyond the masking power of a magnum force room deodorizer.

Over time, I may introduce some western plumbing features that won't disturb the 15th-century bones of our historical structure.

Jump starting a European practice

While the published and generally accepted language of the wine industry is English, enologists and viticulturists in France and Italy politely use English in business only when absolutely necessary. Though I claim some skill with Spanish, I have discovered French and Italian do not come easily as I try to integrate myself professionally and socially into this new culture.

After experiencing a Provencal winter including standing up against a 90 kilometer per hour (54 mph) mistral (the famous north to northwest winds that rampage through the Rhône Valley and resemble the equally famous "Arctic Express" that has its origins in the Gulf of Alaska and the Bering Sea), my wife and I can no longer be considered California tourists, but more or less permanent guests in this beautiful region of France.

Professional activity in Europe

I have become involved in a project in Tuscany that is both innovative in its concept and potentially successful because the enological factors have already been proven in an existing winery setting. Helping to create the exactly correct new facility with all its integrated parts is one of my tasks. The narrative that follows will be more descriptive of the new winery's planning objectives rather than technical design details.

Chianti's wine with a new direction

Trying to insert new technology in an area so richly steeped in tradition is a difficult task at best. The apparent formula for success is using the impoverished soils of the Tuscan hill country to produce grapes that have proven to be adapted to the area, and then to introduce new varieties which, when married in the hands of a skilled winemaker, set a new standard of excellence for others to emulate.

Chianti's new grape handling philosophy and technology

It is not a new concept that the gentle and deliberate movement of grapes, juice, must, and aged wine through the various process steps is reflected in the quality of the final product. Obviously gravity must play an important role in such a production scheme, as it did centuries ago, when electricity and pumps were only in Leonardo da Vinci's fertile imagination.

Thus, to optimize the movement of product by gravity, a multi-level structure is certainly part of the equation. Having all liquid flow down as process steps demand, however, would challenge the most creative architect/engineer and require site topography that would allow hydraulic movement by mere differences in elevation. The alternatives of excavating an enormous shaft or building a "high rise" winery become impractical in the extreme.

There are some prototype wineries in Bordeaux that employ, to a large extent, gravity transfer of grapes, juice, must, and wine. Architects for those facilities have been interviewed by our project's Tuscan owner who collects data on, among other things, incremental costs to achieve gravity flow in place of conventional pumping methods and the winery's operational experience with a non-pump system.

Planning obstacles in Tuscany

The rich winemaking heritage of the Chianti region of Tuscany carries with it strong traditional values on how wine should be made (though the methods are not written into AOC regulations). Thus, a near 100% gravity transfer system would be a fairly radical departure from tradition, as would a structure whose exterior appearance would differ significantly from the ancient "fattorias" that dot the countryside.

Administrative approvals in Chianti for winery plans are achieved most readily just as they are in most governmental jurisdictions where I have worked in the U.S.: by enlisting well-connected local professionals with architecture/planning and law backgrounds who can lubricate the tracks of bureaucracy and help move the project along at a reasonable pace.

Choosing the design team

The use of a design-build firm, a turnkey-team of designers and constructors who undertake the project generally for a fixed fee or cost limit that won't be exceeded, has, in my experience, become the norm in U.S. winery projects. That trend has not penetrated the French or Italian wine industry, thus far.

Competitive bidding among a number of qualified general contractors with winery experience seems to be the option of choice. The traditional construction manager (C.M.), who acts as a buffer/mediator between the owner, the contractor, and design professionals, is also the currently accepted mode for construction contract administration in Italy. The C.M. is employed by the owner.

In large architect/engineer firms, the staff usually includes specialists from each of the important disciplines necessary for developing a complete winery design package. Geotechnical, landscape, electrical/mechanical, controls and instrumentation, structure, and cost estimation may be in-house for the design firm, but often not at the skill/experience level that an outside specialist might bring to the design effort.

With this Tuscan project, design expectations of the owner are such that a high degree of scrutiny of all sub-specialists who might be performing design tasks is required. Personal interviews and individual screening by the winery's design advisory group help focus the owner's choices on key persons who will be responsible for completing construction documents (plans and technical specifications).

Scheduling and fast-tracking

As with any winery project, the owner has a project completion deadline that is intimately related to matching a future harvest date. The relatively remote location for the planned facility does not provide the best parameter for fast-track construction.

The typical construction season for Tuscany is April through October — much like the western U.S. If the designers were fortunate enough to complete the detailed plans by September of 2002, construction might be initiated after the 2002 harvest by scheduling project events that do not interfere with vinification of 2002 grapes.

The proposed site is near the existing winery, presenting a potential problem of conflicts between existing winery operations and new construction.

The possibility of a separate access road to the construction site may be considered to avoid vehicular traffic problems with the existing one-lane, two-kilometer (1.2 mile) access road.

Design phase

As this unique winery plan takes place, and if I remain involved, details of the unique product handling system will be reported in this journal as they evolve. Because of the sensitive political situation described previously, the winery and its ownership must remain unidentified until all permits and licenses are in hand. ■

David Storm is a consulting engineer specializing in winery site utilities and the author of the reference book Winery Utilities: Planning, Design and Construction, *December 1996, Aspen Publishers, Gaithersberg, MD. He currently is living in south central France. E-mail: storm.david@wanadoo.fr*

Fermentation advice

Continued from page 50

It is also important to remember that other inhibitory conditions, such as the presence of acetic acid or low pH, are less well tolerated with increasing ethanol content. If fermentation slows too much or appears to be arrested, ethanol reduction can be considered. It is usually successful in re-initiating fermentation.

Although management of high sugar fermentations may pose challenges not found in fermentations to lower alcohol levels, dry wines can regularly be produced from late harvest fruit. Astute management of yeast nutritional needs and careful monitoring of fermentation temperature are important.

The increased microbial content of musts and juices from very ripe fruit may enhance complexity, but the activity of the wild microbes should be routinely monitored. With these precautions in mind, high sugar musts and juices can be fermented to dryness. ■

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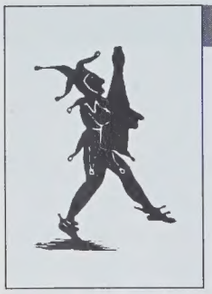

IN THE CELLAR *by Jake Lorenzo*

Bigger and Better

Perspective is an odd thing. It's never the same for any two people. To Jake Lorenzo, Chuy Palacios is average height; to Kobe Bryant, Chuy's a short guy starting to bald on top.

To Jake Lorenzo, Chuy's hot sauce is just right; to Kobe Bryant, it's a burning chili torture that swells his tonsils, and makes him fall down clutching his throat like P. J. Carlissimo after a Latrell Sprewell attack. To most basketball fans, Kobe Bryant is the best young player in the NBA. To Chuy, he's just another tourist who talks big, but can't handle *picante*.

Jake Lorenzo has his own unique perspective. Generally, I like things small. I prefer small oysters that you can slurp down rather than the really large ones you have to chew. I enjoy dining on several small delicious courses, rather than trying to stuff down an entrée that requires a hydraulic lift to be settled on the table.

I am fond of well-behaved medium-sized dogs as opposed to 140-pound monsters that jump up on you, knock you to the ground, and lick your face like you were a bowl of gravy.

Don't get me wrong. Jake Lorenzo likes lots of big things. Mountains should be big and capped with snow and pine trees. I like big planes when we're traveling, so the turbulence doesn't toss us around like bungee jumpers off the Golden Gate Bridge. Grand Canyon is a much more interesting crack in the ground than the trench they keep digging in Highway 12 each summer to screw up the traffic at the height of tourist season in Sonoma Valley.

When it comes to events, I don't really care how big they are. I'm more concerned with how crowded they feel. Jake Lorenzo and Jakelyn's mother went to Jazz Fest in New Orleans for 12 consecutive years. For a long time, it was our favorite festival.

The food booths sold delicious portions of Creole specialties for $3. About 25,000 people would comfortably roam the usually muddy grounds. Various stages would feature local acts like Bois Sec (all of whom were over 70), the Bluerunners (who were just starting out), and classic Big Easy singers like Lillian Boutté or Leah Chase. Headliners would be the Neville Brothers, Doctor John, The Meters, or Fats Domino. All in all, it was a New Orleans thing.

Nowadays Jazz Fest crams 50,000 to 80,000 people a day into the Fairgrounds. Food prices have doubled. The emphasis on local acts has given way to giant national acts like Jimmy Buffet, Al Green, Bob Dylan, and Phish. Jake Lorenzo agrees that all of these acts are great (well ... I'm not sure about Phish), but what happened to New Orleans?

I'm sure the managers of Jazz Fest love the higher prices, the crowds, and the prestige of the big acts. From their perspective, it's a much more successful event. More than anything, they love the money rolling into the coffers. "Some of it goes to charity, you know."

Jazz Fest keeps getting bigger, and hundreds of thousands of people love it enough to keep going, but from Jake Lorenzo's perspective, it has become a bloated, overcrowded, pretentious party.

I have a better time at the smaller, much more local French Quarter Fest. In fact, New Orleans by The Bay right here at Shoreline Amphitheater every June offers more of what I liked about Jazz Fest than the current extravaganza in New Orleans. And the Russian River Jazz Festival in Guerneville each September offers a wonderful Northern California version of community and music.

It seems like every event strives to get bigger. Success is measured by how many people attend, or how much money is made, or how much is contributed to the designated charity. As an event grows, it attracts sponsors, gains advertising and publicity, and larger crowds. The events feed themselves, along with an ever-growing cadre of workers, promoters, and volunteers. Eventually, they lose their individuality as growth makes them just like any other big event.

The wine business knows all about getting bigger. Vineyards have continued to proliferate throughout California, Oregon, Washington and other parts of America. We may soon drown in the oncoming sea of bulk wine accumulating in tanks all over the country.

The Napa Wine Auction has grown into an ostentatious ode to ego and money. "Some of it goes to charity, you know." The ZAP tasting now requires two halls at Fort Mason in San Francisco and still can't handle the crush of crowds clamoring for their Zinfandel.

So, it was with great trepidation that Jake Lorenzo accepted an invitation to attend this year's Rhone Ranger tasting event. I was stunned at how comfortable the whole thing was. Lots of people attended, to be sure, but there was no crush of bodies against the tables. The din of voices ricocheting around the old barn of a building was bearable rather than mind-numbing as it has been in the past. Winemakers and owners manned the tables, and were available to answer questions if necessary, but mostly they just poured.

There were Viogniers, Marsannes, Carignanes, Grenaches, Syrahs, and Petite Sirahs. Most of them were well made, and Jake Lorenzo found a few of them to be thrilling.

Kevin Hamel continues to make big, lush, age-worthy Syrah. McCrea Cellars from Washington state had a stable of elegant Syrahs. Chuy liked the Jade Mountain Syrah, and Jakelyn's mother thought the Foxen was pretty good. I tasted about 30 wines in a relaxed, comfortable setting over the course of 90 minutes. From my perspective it was a terrific event.

I don't know about the perspective of the Rhone Rangers. I mean, what good is a room full of Rhone Rangers if there aren't enough people for them to protect and serve? Rangers connote law and order in the face of wine crimes. After all, they helped save us from Chardonnay.

Maybe they had hoped for a crush of clamoring fans grappling for tastes of Rhone splendor. Perhaps they would have preferred teeming throngs fighting for tastes of Viognier and Marsanne. What they got was civilized. I liked it. In fact, I may go back again next year.

I suppose there is a lesson to be learned here, but Jake Lorenzo is a private eye, not a teacher. I can tell you this, when a big event turns out to be smaller than expected, it's

always a good thing for the attendees. It's basic economics. At an event, the attendees are the demand, and the people putting on the event are the supply. Relax the demand, and the suppliers get nicer, friendlier, and cheaper.

In the wine business, wineries are the supply and consumers are the demand. Today, supply is getting way ahead of demand. Less demand means the wineries will get nicer, friendlier, and cheaper. A boom time's a'comin' for consumers — and Jake Lorenzo is one. Bring it on. I'm ready. ■

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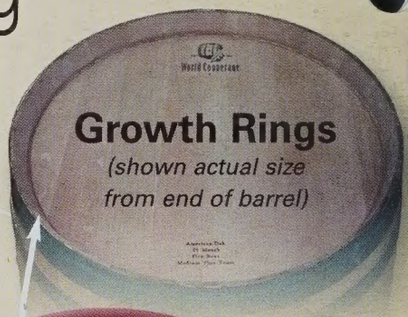
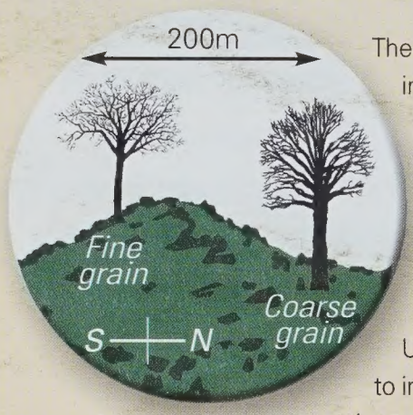
A Better Understanding of Fine Grain Oak and its Significance in Winemaking

Part 3 of a continuing oak **education** series

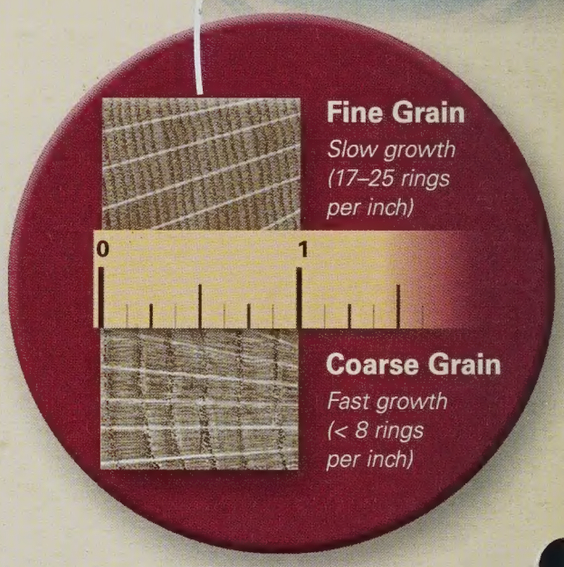


Variability Within Appellations

Winemakers use the term 'grain tightness' to describe the distance between growth rings of a tree. Flavor effects occur when the growth rate is extremely slow (extra-fine grain).



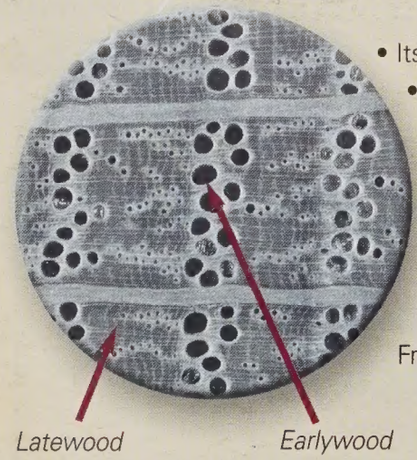
The tree's growth rate is the result of several factors including soil moisture, soil quality, forest density, and tree location. Overall, these factors outweigh the influence of appellation. For example trees that grow only a short distance apart in the same forest can have very different grain. In fact grain tightness varies within a tree. Realizing this World Cooperage emphasizes grain type, not appellation. Unlike other coopers, we have the unique opportunity to individually sort our mills' staves and select the finest grain staves for crafting wine barrels.



Fine Grain Contains More Earlywood

An oak tree's annual rings consist of two distinct parts; earlywood grows during spring, and latewood grows during the remainder of the year. The amount of earlywood is quite constant but the latewood varies greatly according to soil moisture, nutrients, and the trees exposure to sun. In fine grain staves the percentage of earlywood can be as high as 50% while as low as 5% in coarse grain oak.

The advantage is that earlywood cells contain an abundance of extractives and are more permeable than the dense and fibrous latewood. Notable features of the larger earlywood cells that benefit wine maturation are:



(Medium grain oak)

- Its lignin is a rich source of vanillin
- Its tannins are easily extractable
- Cask driven oxidation is enhanced as cells are more porous
- A spectrum of volatile acids esterify in the presence of wine thereby increasing 'fruit' production
- Compounds such as caryophyllene (particularly in French oak) add spicy characters

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